PHYSICAL FLOW WATER ACCOUNTS

Strengthening Environment, Climate Change
and Disaster Statistics (ECDS) Project
Bangladesh Bureau of Statistics
Statistics and Informatics Division
Ministry of Planning
Government of the People's Republic of Bangladesh

CEGIS Center for
Environmental and Geographic
Information Services

PHYSICAL FLOW
WATER ACCOUNTS

JUNE 2025

বাংলাদেশ পরিসংখ্যান ব্যুরো
পরিসংখ্যান ও তথ্য ব্যবস্থাপনা বিভাগ
পরিকল্পনা মন্ত্রণালয়

Bangladesh Bureau of Statistics
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WATER ACCOUNTS

Prepared by

Strengthening Environment, Climate Change and Disaster Statistics (ECDS) Project
Bangladesh Bureau of Statistics &
Center for Environmental and Geographic Information Services (CEGIS)

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Director General
Bangladesh Bureau of Statistics

Preface

The Bangladesh Bureau of Statistics (BBS) is going to publish the Physical Flow Water Accounts for the first time in the country, following the System of Environmental-Economic Accounting (SEEA) framework. This report provides detailed and comprehensive data on the supply and use of water resources across key economic sectors, including agriculture, industry, and households. It offers valuable insights into water abstraction, consumption, return flows, and wastewater generation.

As the National Statistics Office (NSO), the Bangladesh Bureau of Statistics (BBS) is committed to enhancing access to policy-relevant information for researchers, policymakers, and citizens by providing comprehensive statistics that support informed decision-making. In line with this mission, BBS has prepared Physical Flow Water Accounts, to fulfill its objective of addressing the needs and priorities of its users. This report aims to assess the status of water resources and outline a strategic approach for their efficient use, thereby contributing to the achievement of the Sustainable Development Goals (SDGs).

I would like to extend my deepest gratitude to respected Secretary of the Statistics and Informatics Division (SID), for prudent guidance and tireless effort throughout the entire process of preparing this innovative report. My sincere thanks to Project Director of the Strengthening Environment, Climate Change and Disaster Statistics (ECDS) Project, BBS and his team for their dedication and outstanding efforts towards the preparation of the report.

I trust this publication will be an essential guide for all stakeholders, equipping them with valuable insights to drive informed decisions and sustainable water management strategies.

Dhaka
June 2025

Mohammed Mizanur Rahman

Project Director
ECDS project
Bangladesh Bureau of Statistics

Acknowledgement

The report titled "Physical Flow Water Accounts" is one of the most innovative publications under the Strengthening Environment, Climate Change, and Disaster Statistics (ECDS) Project of the Bangladesh Bureau of Statistics (BBS). The data and information presented in this report have been sourced primarily from secondary materials, including various international publications and articles. The findings of this report will play a crucial role in shaping new policies aimed at achieving the Sustainable Development Goals (SDGs) by assessing the status of water resources and promoting their efficient use. I firmly believe that this publication will generate significant interest among policymakers, researchers, academics, students, and other stakeholders, fostering a deeper understanding of these critical issues.

I would like to begin by expressing my sincere gratitude to the Secretary of the Statistics and Informatics Division (SID), Ministry of Planning for the invaluable support and guidance in successfully accomplishing this report. I extend my heartfelt thanks to Mr. Mohammed Mizanur Rahman, Director General of BBS, whose dedication, passion, and insightful comments played a crucial role in ensuring the timely completion of this publication. My deepest appreciation goes to Mr. S M Shakil Akhter, Additional Secretary & Dr. Dipankar Roy, Joint Secretary, Statistics and Informatics Division; and Mr. Md. Rafiqul Islam, Director, National Accounting Wing, BBS for their exceptional efforts throughout the preparation of this publication. I am also grateful to the Chairperson and all members of the various committees involved in the publication of this report.

I sincerely thank the ECDS project team namely Mr. Surangit Kumar Ghosh, Assistant Project Director and Mr. Aminur Rahman Khan, Ms. Atia Bilkis, Ms. Sarmin Karim & Mr. Md. Ahsan Habib, Statistical Officer for their valuable efforts in compiling and reviewing this report. A profound acknowledgment is due to CEGIS, which invaluable expertise provided the foundational themes and structural framework, shaping both the organization of the report and its overall findings.

Comments and suggestions for further improvement of the report will be highly appreciated.

Dhaka
June 2025

Mohammad Saddam Hossain Khan

Key Findings

Sl. No.	Description	Measurement unit	Value (2021-22)
1	2	3	4
01.	**Physical Supply of Water Resources in Bangladesh**		
	Abstracted Surface Water	Km^3/BCM	46.89
	Abstracted Groundwater	Km^3 /BCM	21.85
	Total Supply of Abstracted Water	Km^3/BCM	68.74
02.	**Physical Use of Water Resources in Economic Sectors of Bangladesh**		
	Agriculture, Forestry, & Fishery	Km^3/BCM	58.91
	Mining & Quarrying	Km^3/BCM	0.02
	Manufacturing	Km^3/BCM	2.94
	Electricity	Km^3/BCM	1.50
	Water Supply and Households	Km^3/BCM	5.12
	Sewerage	Km^3/BCM	0.18
	Other Industries	Km^3/BCM	0.07
	Total Water Use	Km^3/BCM	68.74
03.	**Water Asset Account**		
	Opening Stock	Km^3/BCM	1227.03
	Surface Water	Km^3/BCM	1205.91
	Groundwater	Km^3/BCM	21.12
	Returns (from Economy)	Km^3/BCM	68.74
	Precipitation	Km^3/BCM	393.42
	Inflows from other territories	Km^3/BCM	1122.00
	Total additions to stock	Km^3/BCM	2811.19
	Abstractions (to Economy)	Km^3/BCM	68.74
	Outflows to the sea (The Bay of Bengal)	Km^3/BCM	1373.00
	Total reductions in stock	Km^3/BCM	1441.79
	Closing Stock	Km^3/BCM	1369.40
04.	**Monetary Account**		
	Natural Water (CPC 1800)	Tk in Billion	100.00
	Sewerage (CPC 941)	Tk in Billion	5.00

Acronyms

ADP	Annual Development Program
BADC	Bangladesh Agricultural Development Corporation
BAPA	Bangladesh Agro-Processors' Association
BBS	Bangladesh Bureau of Statistics
BCM	Billion Cubic Meter
BCMCL	Barapukuria Coal Mining Company Limited
BER	Biological Exploitation Rate
BGFCL	Bangladesh Gas Fields Company Ltd.
BMD	Bangladesh Meteorological Department
BPDB	Bangladesh Power Development Board
BSCIC	Bangladesh Small and Cottage Industries Corporation
BTA	Bangladesh Tanners Association
BWDB	Bangladesh Water Development Board
CEGIS	The Center for Environmental and Geographic Information Services
DoF	Department of Fisheries
DPHE	Department of Public Health Engineering
EDG	Electronic Discussion Group (on terms and definitions for SEEA-Water)
FAO	Food and Agriculture Organization
FDES	Framework for the Development of Environment Statistics
FRSS	Fisheries Resources Survey System
GDP	Gross Domestic Product
GIS	Geographic Information System
GOAP	Global Ocean Accounts Partnership
GVA	Gross Value Added
GW	Ground Water
ICRD	Integrated Coastal Resources Database
ICZMP	Integrated Coastal Zone Management Plan
ISIC	International Standard Industrial Classification
IWM	Integrated Water Management
IWRM	Integrated Water Resource Management
JRC	Joint Rivers Commission
KII	Key Informant Interview
Km^3	Cubic kilometer
MPEMR	Ministry of Power, Energy, and Mineral Resources
MSUT	Monetary Supply and Use Table
NAMWA	National Accounting Matrix including Water Accounts
NIS	National institute of Statistics
NSDI	National Spatial Data Infrastructure

NZ	New Zealand
OECD	Organization for Economic Co-operation and Development
PSUT	Physical Supply and Use Tables
RMG	Ready Made Garments
SDG	Sustainable Development Goals
SEEA	System of Environmental Economic Accounting
SEEA CF	SEEA Central Framework
SEEA EEA	SEEA Experimental Ecosystem Accounting
SEEAW	System of Environmental Economic Accounting for Water
SEES	System of Environmental Economic Statistics
SGG	Sustainable Development Goals
SNA	System of National Accounts
SW	Surface Water
UN	United Nations
UNDP	United Nations Development Program
UNSD	United Nations Statistics Division
UNSTAT	United Nations Statistical Division
WAA	Water Assent Account
WARPO	Water Resources Planning Organization
WASA	Water and Sewerage Authority
WUE	Water Use Efficiency

Executive Summary

Executive Summary

Given its important role in overall development, several countries have produced Water Accounts or are in the process of producing. Generally, Water Accounts consist of three main accounts such as the (i) Asset Account; (ii) Physical Supply and Use (PSUT) of Water; and (iii) Monetary Account.

Bangladesh does not have Water Accounts. This exercise is an ambitious attempt to compile the Water Accounts for Bangladesh under the aegis of BBS. Realizing the challenges of data availability, BBS and CEGIS have adopted various approaches to generate as much data as possible from the official sources. Stakeholder consultations were organized to present data collection template, discussion on the methodology and ready availability of data. Almost all organizations involved in Water related activities participated in the consultation workshops. The compilation teams (at BBS and CEGIS) expected that the 3 Water Accounts may be developed from the agency data. Their first responses were that most of the data are available. However, later they realized that the data collected by them are not ready for the compilation of the Water Accounts. Thus, the compilation team adopted an approach to supplement the agency data with data from international (i.e. mainly international multi-lateral agencies) and national sources (i.e. research reports and publications) to produce the Bangladesh Water Accounts. Despite these efforts, limited data were made available to the compilation team. Using these data, BBS/CEGIS have been able to develop (which may be considered as 'benchmark') three core Water Accounts for Bangladesh.

Against this backdrop, the study revealed that in 2021–22, Bangladesh abstracted a total of 68.74 billion cubic meters (BCM) of water, with 46.89 BCM sourced from surface water and 21.85 BCM from groundwater. This entire supply was utilized across various economic sectors, predominantly by agriculture, forestry, and fisheries (58.91 BCM), followed by water supply and households (5.12 BCM), manufacturing (2.94 BCM), and electricity generation (1.50 BCM). The country's water asset account recorded an opening stock of 1227.03 BCM, with significant additions from precipitation (393.42 BCM) and transboundary inflows (1122.00 BCM), totaling 2811.19 BCM. With outflows to the Bay of Bengal and economic abstractions amounting to 1441.79 BCM, the closing stock stood at 1369.40 BCM. In monetary terms, natural water use was valued at Tk 100 billion, while sewerage services were estimated at Tk 5 billion.

The most important finding of this benchmark study is that much of the data related to water accounts is not currently available. However, those missing flow accounts are essential and paramount to the development of comprehensive water accounts for Bangladesh.

Without such a complete illustration, the water accounting of a particular country and economy may not appear very useful to policymakers for understanding water productivity in different sectors. Besides, many of the estimated figures related to water resources are old perhaps lacks rigorous validation. Against this backdrop/limitation, new data is required for re-estimation of the water SEEA in Bangladesh.

Another important observation of the study is that several agencies are working in this area. However, most of them lack a clear understanding of the data collection need and hence strategies. It is thus important to pursue the following:

- Developed a work plan and strategy by agencies to collect data. BBS and agencies may agree to develop a road map of data collection for water accounts in Bangladesh.
- Carry out a needs assessment on current capacity and requirements by agencies with regards to data collection template, and data collection strategies.

Chapter I
Introduction

Chapter I
Introduction

In a lecture delivered at the Washington DC 'think tank' Resources for the Future in 1992 (Solow, 1992, 1993), the Nobel laureate economist Robert Solow suggested that 'an innovation in social accounting practice could contribute to more rational debate and perhaps more rational action in the economics of non-renewable resources and the approach to a sustainable economy'.

His suggestion emerged out of the consensus that the conventional system of national accounts followed in most countries as a measure of the national income – the System of National Accounts (SNA) designed by the United Nations Statistical Division (UNSTAT), is not adequate for measuring or monitoring the impact of environmental changes on income or welfare. However, this conclusion was not surprising, since the development of national accounting (mainly in the 1940s and 1950s) took place in a period where there was little concern about the impact of economic development on the environment. During that time, the conceptual basis and scope of the national accounts were governed by definitions of income and wealth which did not consider the depletion of natural resources or the costs of environmental damage such as pollution.

There is now the widespread realization that production and consumption activities have environmental consequences that impose considerable costs on society, some of which would be borne by future generations. Therefore, there is a perceived requirement for information/data that will guide sustainable management of economic activity.

Following the above consensus or agreement there have been attempts to measure environmental impacts of economic activities and to integrate these into the System of National Accounts (SNA). Accordingly, 1993 version of the international System of National Accounts (SNA), published in 1993 by the United Nations Statistical Division (UN, 1993b), addressed for the first time the possible incorporation of environmental costs and assets into the SNA. Instead of proposing a direct incorporation into the SNA, UNSTAT suggests adopting the concept of the 'satellite' account for compiling environmental accounts. The suggestion is to take the standard SNA as a starting point to measure how they might be complemented or modified by the inclusion of stocks and flows arising from the interaction between the economy and the environment. The accounting formwork capturing the interaction between the economy and the environment has been formalized as the system of environment and economic account (SEEA). The SEEA began its development following the 1987 Bruntland Report, which was the first document to define sustainable development. SEEA was adopted as an international statistical standard by UN Statistical Commission in 2012. The SEEA focuses on (i) accounting adequately for the depletion of scarce natural resources and (ii) measuring the costs of environmental degradation and its prevention.

Following the above trend, the National institute of Statistics (NIS), Cambodia is also contemplating implementing the SEEA in Cambodia. A concept note was developed on 'Constructing and Compiling the System of Environmental-Economic Statistics of

Cambodia (SEES) in consultation with the Department of Economic Statistics, National Institute of Statistics, Ministry of Planning. A key step towards the compilation of SEEA is to understand the underlying frameworks. This report discusses the frameworks used in the compilation of SEEA.

The report is based on secondary sources and desk review. In addition to the introduction and background, the rest of the report is composed of four more sections. Section two discusses SEEA framework. Section three discussed the integrated framework with SEEA satellite account, SNA, SUT and EIOT. SEEA framework for Water is presented in section four. The last section discusses SEEA framework for Energy.

1.1 Scope and Coverage

Current assessment draws all outcomes based on the United Nations System of Environmental-Economic Accounting 2012 Central Framework (SEEA-CF). The SEEA-CF is a multi-purpose conceptual framework that describes quantitatively the interaction between the economy and the environment, as well as the stocks and changes in stocks of environmental assets. It enables the integration of economic and environmental information which will allow us to see the links and relationships between environmental quality and economic well-being – insights that might be invisible when we look at economic and environmental data separately. Adopted as an international statistical standard by the United Nations Statistical Commission, the SEEA-CF also uses an agreed set of standard concepts, classifications, definitions, accounting principles, and tables which allows for comparison of the accounts and indicators between countries.

Three main accounts are discussed in the SEEA-CF, namely: (1) the asset accounts, also known as stock accounts, which record the stocks and changes in stocks of environmental assets, such as water resources, (2) the flow accounts, which measures the flows of water, energy and material from the environment to the economy and vice versa, in both physical and monetary flows; and, (3) the environmental activity accounts which focuses on environmental goods and services, as well as expenditures on environmental protection and resource management. This report on Bangladesh Water Account primarily focuses on three core accounts for the fiscal year 2021-2022, which are:

- Water Asset Account (WAA)
- Physical Supply and Use Table (PSUT) of Water Resources
- Monetary Supply and Use Table (MSUT) of Water Resources

1.2 SEEA – Framework for Environment and Economic Accounting

SEEA is a conceptual framework for measuring the interactions between the environment and the economy. SEEA is an outcome of the combined contributions of the United Nations, European Commission, Food and Agriculture Organization, Organisation for Economic Co-operation and Development, International Monetary Fund, and World Bank Group. It was adopted as an international statistical standard by UN Statistical Commission in 2012. Thus, SEEA is an internationally agreed statistical framework to measure the environment and its interactions with the

economy. The broad nature of SEEA suggests it is suitable for all countries and all aspects of environmental accounting. A country, however, can choose to implement different components of SEEA depending on its needs and priorities. As mentioned above, SEEA is a satellite system of SNA and incorporates environmental and economic information together using SNA principles, concepts, and definitions. SEEA guides the measurement of:

- the stocks of natural resources;
- their flows into and within the economy; and
- the flows of residuals back to the environment.

The SEEA framework consists of two parts, the SEEA Central Framework (SEEA CF) and the SEEA Experimental Ecosystem Accounting (SEEA EEA).

- The SEEA CF takes the perspective of the economy and measures how the economy uses the environment as the provider of natural resources and receiver of residuals in the form of waste and emissions into air and water resulting from economic activities. ***Thus, its structure is very close to the structure of the System of National Accounts.***
- The SEEA EEA instead takes the perspective of the ecosystems and measures their functioning as integrated systems spatially explicit. ***As such the SEEA EEA framework is more loosely connected to the SNA, although fully aligned.***
- The SEEA also ***proposes a more transparent treatment of expenditures on environmental protection,*** by proposing a finer breakdown of the ISIC codes that relate to environmental protection, and by transferring protective expenditures that are undertaken as ancillary activities from their industries of origin to the relevant subsector of environmental protection services.
- The SEEA does not recommend specific indicators but focuses on providing a systematic and methodologically sound approach to compiling environmental-economic statistics.
- Data for SEEA accounts is usually collected from business and household surveys related to resource extraction and use.

1.3 SEEA Accounts

The SEEA covers the following four accounts.

1. **Flow accounts**: Flow accounts use physical units to measure the flows of materials and energy that enter and leave the economy and the flows of materials and energy within the economy. These measures are called physical flows. In broad terms, the flows from the environment to the economy are recorded as natural inputs (e.g., flows of minerals, timber, fish, and water). Flows from the economy to the environment are recorded as residuals (e.g., solid waste, air emissions, and return flows of water). It can also be considered as supply and use tables for products, natural inputs and residuals (e.g.,

waste, and wastewater etc.) generated by economic activities.

2. **Stock accounts**: The use of natural inputs is linked to changes in the stock of environmental assets that generate those inputs. Environmental assets are the naturally occurring living and non-living components of Earth, together constituting the biophysical environment, which provides benefits to humanity. Although naturally occurring, many environmental assets are transformed to varying degrees by economic activities. SEEA has two perspectives on environmental assets.
    - Central framework focuses on individual components of the environment that provide materials and space to all economic activities, for example, resources such as minerals and energy, timber, water, and land.
    - The experimental ecosystem accounting framework focuses on the interactions between individual environmental assets within ecosystems. It looks at the broad set of material and non-material benefits that accrue to the economy and other human activity from flows of ecosystem services. Ecosystems are dynamic communities of plants, animals, and microorganisms interacting with their non-living environments as a functional unit. Examples are terrestrial (e.g. forests and wetlands) and marine ecosystems. Often, different ecosystems interact at local and global levels.

3. **Combined physical and monetary accounts:** It bring together physical and monetary information for derivation indicators, including depletion-adjusted aggregates. The physical and monetary accounts complement each other. To maintain consistency with the economic accounts, it is preferable to measure the value of natural resources using exchange values. Some assets may only be measured in physical terms, such as soil resources, water resources, and ecosystems, as there is no economic exchange of these assets. Changes within these assets often can be measured (e.g. the degradation and depletion of soil resources or the volume of water in lakes), but the opening and closing stocks cannot. When monetary and physical accounts are combined, the change in the value of an environmental asset is due to price or quantity effects, or a combination of both. This applies to both stock and flow accounts. It has two parts:
    - The physical accounts show what is happening in the environment and are expressed in terms that are easy to understand.
    - Monetary accounts are expressed in a common unit of measurement (i.e., national currency) allowing different resources to be compared using the same units. Valuation is calculated in a way that is consistent with SNA, meaning monetary estimates can be linked to the current national accounts.

4. **Transaction (Activity/purpose) accounts:** It explicitly identifies environmental transactions already existing in the SNA. More specifically, SEEA records the flows of economic activities related to the environment, such as expenditures on environmental protection and resource management, and the production of environmental goods and services. Records of economic activities undertaken for environmental purposes are

called functional accounts. The SEEA framework provides a more complete view of the environmental aspects of the economy by considering environmental transactions such as taxes, subsidies, grants, and rent.

SEEA covers a broad range of environmental assets, residuals, and environmentally related economic transactions. Tables below describes stock/flow accounts and transaction accounts.

Table 1.1: SEEA Stock and Flow Accounts

Accounts	Types of Accounts			Description of Information
	Physical stock	Physical flows	Monetary stock and flow	
Air emissions		x		Generation of air emissions by resident economic units (industry and households) and by substance type.
Energy	x	x	x	Energy flows from the initial extraction or capture of energy resources from the environment into the economy, to the flows of energy within the economy in the form of the supply and use of energy by industries and households. Also, the flow of energy flows back into the environment.
Water	x	x	x	Water flows from the initial abstraction of water resources from the environment into the economy, to the water flows within the economy in the form of supply and use by industries and households and finally flows of water back to the environment.
Waste	x	x	x	Generation of solid waste and management of flows of solid waste to recycle facilities, controlled landfills, or directly to the environment.
Fish	x	x	x	Total biomass of all species that are subject to harvesting activity or cultivated within the national boundary.
Timber	x	x	x	Volume and value of timber resources at the beginning and end of an accounting period and change in the stock

				(natural growth and removals) over the accounting period.
Accounts	Types of Accounts			Description of Information
	Physical stock	Physical flows	Monetary stock and flow	
Land	x		x	Land use and land cover data, useful for assessing impact of urbanization, intensity of crops and animal production, and afforestation and deforestation.
Minerals	x		x	Quantities and values of stocks and resources and the changes in these over accounting periods. Flows of extraction, depletion, and discoveries provide information on the availability of individual resources.
Ecosystem condition and extent	x			The overall quality of the ecosystem asset and its size.
Ecosystem services	x		x	Provisioning, regulating, and cultural ecosystem services from a specified ecosystem (e.g. agricultural or forested land, inland waters). Most services are specified in physical terms, although services that are traded are estimated using market prices.
Economy-wide material flow		x		Aggregate overview of the material inputs and outputs of an economy, including inputs from the environment, outputs to the environment and the physical amounts of imports and exports.

Source: Stats NZ (2018)[1]

[1] Stats NZ (2018), "Environmental-economic accounts: Sources and methods," February 2018.

Table 1.2: SEEA Transaction Accounts

Accounts	Description of Information
Environmental goods and services sector	Consider environmental activities from the supply perspective and presents information on the production of environmental goods and services. Assists in understanding the economic response to the challenges of environmental degradation and the depletion of natural resources.
Environmental protection expenditure	Identifies and measures society's response to environmental concerns through the supply of and demand for environmental protection services and through the adoption of production and consumption behaviour aimed at preventing environmental degradation.
Environmental taxes	Records the amount of energy, transport, pollution, and resource taxes paid to government for something that has a proven scientific negative impact on the environment.

1.4 Limitation

There are serious limitations of the data to produce comprehensive Water Accounts in Bangladesh. The administrative agencies do not collect data according to the needs of the comprehensive Water Accounts.

As a baseline assessment of the Bangladesh Water Accounting, this study could not capture the water usage in the industrial sector particularly the Readymade Garments (RMG) sector in details due to the unavailability of the relevant data. Hence, there is much scope to improvise this section.

Water Use Efficiency in respective sectors is a major component of any water accounting. Since data of industrial water usage is not fully explored, estimation of Water Use Efficiency (WUE) may appear misleading.

Chapter II
Concept and Definition

Chapter II
Concept and Definition

This study on Water accounts draws on and combines concepts, definitions, classifications, and frameworks from hydrology as well as environmental, economic, demographic, and social statistics. Chapter II reflects a concise overview of key concepts concerning water in the environment, economy, and society, along with those related to inland water resources. It also introduces the **SEEA-Water framework**, which serves as the foundation for integrating environmental and economic statistics related to water. Along with this, most of the concepts and definitions were retrieved from **SEEA Technical Note on Water Accounting 2017 and International Recommendations for Water Statistics (IRWS) 2012.** Detailed information about the statistical units comprising the economy and the environment is presented in Chapter III.

Abstraction for Distribution: Water abstracted for the purpose of its distribution. (EDG)

Abstraction for Own Use: Water abstracted for own use. However, once water is used, it can be delivered to another user for reuse or for treatment. (EDG)

Abstraction: The amount of water that is removed from any source, either permanently or temporarily, in each period for final consumption and production activities. Used water for hydroelectric power generation is also considered to be abstraction. Total water abstraction can be broken down according to the type of source, such as water resources and other sources, and the type of use. (EDG)

Actual Final Consumption of General Government: The value of the government's total final consumption expenditure less its expenditure on individual goods or services provided as social transfers in kind to households. It is thus the value of the expenditures that the government incurs on collective services. (Based on 2008 SNA, paras. 9.103)

Actual Final Consumption of Households: The value of the consumption of goods and services acquired by individual households, including expenditures on non-market goods or services sold at prices that are not economically significant and the value of expenditures provided by government and NPISHs. (2008 SNA, para. 9.81)

Asset Accounts: Asset accounts capture changes in the stock of natural resources over time. They provide information on the availability, condition, and value of environmental assets, including land, forests, fisheries, and minerals. By valuing these assets, the SEEA enables policymakers to assess their contribution to national wealth and economic development.

Consumptive Use of Water: The part of water withdrawn from its source, that will not become available for reuse.

Distributed Water: Abstracted water received from other economic units, particularly from the Water Supply industry.

Emission to Water: Direct release of a pollutant into water, as well as its indirect release by transfer to an off-site wastewater treatment plant. (Based on the European Commission, 2000, available from http://www.eper.cec.eu.int/eper/documents/guidance_html/index.htm)

Enterprise: An enterprise is an economic unit in its capacity as a producer of goods and services. An enterprise may operate one or more establishments, and may produce a variety of goods and services.

Establishment: An establishment is an enterprise or part of an enterprise that is situated in a single location and in which (a) only a single (non-ancillary) productive activity is carried out or (b) the principal productive activity accounts for most of the value added. Establishments are also known as local kind-of-activity units (local KAUs). Establishments are classified as industries using International Standard Industrial Classification (ISIC) Rev. 4, based on their principal productive activity. Establishments also include government (i.e., a government office is an establishment).

Evaporation of Abstracted Water: The amount of evaporation when water is distributed between economic units after abstraction (e.g. during distribution via open channels or while in water storage).

Final Consumption Expenditure of Households: The expenditure, including imputed expenditure, incurred by resident households on individual consumption goods and services, including those sold at prices that are not economically significant. (2008 SNA, para. 9.94)

Flows: Flows are the quantity that is added or subtracted from a stock during a specific period. Flows are identified in both economic and environmental statistics. Economic flows reflect the creation, transformation, exchange, transfer, or extinction of economic value; they involve changes in the volume, composition or value of an economic unit's assets and liabilities.

Groundwater: Water which collects in porous layers of underground formations known as aquifers. (SEEA-2003)

Household: A household consists of one or more persons who live together, share meals, and cook from a common kitchen arrangement. In addition to family members, a household may also include other relatives or non-relatives. However, even if someone is a family member, they will not be considered part of the household if they do not share meals from the same kitchen or do not live together. A person living separately can also form a household if they prepare and consume their meals independently. (population census 2022)

Intermediate Consumption: The value of the goods and services consumed as inputs by a process of production, excluding fixed assets, the consumption of which is recorded as consumption of fixed capital; the goods or services may be either transformed or used up by the production process. (Based on 2008 SNA, para 6.213)

Irrigation Water: Water artificially applied to land for agricultural purposes. (UNESCO/WMO *International Glossary of Hydrology*, 2nd ed., 1992)

Losses: Volume of water lost between the point of abstraction and a point of use.

Monetary Accounts: Monetary accounts assign economic values to environmental resources and their services. They quantify the economic benefits derived from ecosystem services, such as pollination, water purification, and climate regulation. By incorporating these values into economic indicators, such as GDP, policymakers gain insights into the true costs and benefits of economic activities.

Non-consumptive Use of Water: Water remains in or is immediately returned to the point of extraction and is still available for use.

Physical Flow Accounts: Physical flow accounts track the extraction, use, and disposal of environmental resources. These accounts quantify the flows of natural resources from the environment to the economy, such as energy and water extraction, as well as emissions and waste generated by economic activities.

Recycled Water: The reuse of water within the same industry or establishment (on site). (EDG)

Reused Water: Wastewater delivered to a user for further use with or without prior treatment. Recycling within industrial sites is excluded. (EDG)

Soil Water: Water suspended in the uppermost belt of soil, or in the zone of aeration near the ground surface that can be discharged into the atmosphere by evapotranspiration. (EDG)

Standard River Unit (SRU): A river stretches of one kilometre with a water flow of one cubic metre per second. (SEEA-2003, para. 8.128)

Stocks: Stocks are the quantity of a particular product or natural resource at a point in time. Stocks are identified in both economic and environmental statistics, although the terminology varies depending on the context, and they can be measured in physical and monetary terms. Physical stocks of water may also have different levels of water quality.

Supply of Water to Other Economic Units: The amount of water that is supplied by one economic unit to another and recorded net of losses in distribution. (EDG)

Surface Water: Water which flows over, or is stored on, the ground surface. It includes artificial reservoirs, lakes, rivers and streams, glaciers, snow and ice. (EDG)

System of Environmental Economic Accounting (SEEA): In practice, NRA/NCA structure includes the compilation of physical supply and use tables, functional accounts and asset accounts for natural resources like water and wetland, ocean (blue economy), land and soil, forest, ecosystem, energy, fisheries, waste, air emission (GHG), disaster expenditure etc. The integration of information concerning the economy and the environment requires an interdisciplinary approach. The System of Environmental-Economic Accounting (SEEA) CF brings together, in a single measurement system. Each of these areas has specific and detailed measurement approaches that are integrated in the SEEA CF to provide a comprehensive as a holistic view. The concepts and definitions that comprise the SEEA CF are designed to be applicable across all countries, regardless of their level of economic and statistical development, their economic structure, or the composition of their environment. The SEEA

CF will be accompanied by two related parts 1) SEEA Ecosystem Accounts, and 2) SEEA Extensions and Applications.

Transpiration: The amount of soil water absorbed by cultivated plants and subsequently released to the atmosphere.

Wastewater: Water which is of no further immediate value to the purpose for which it was used or in the pursuit of which it was produced because of its quality, quantity or time of occurrence. However, wastewater from one user can be a potential supply of water to a user elsewhere. It includes discharges of cooling water. (EDG)

Water Consumption: That part of water uses which is not distributed to other economic units and does not return to the environment (to water resources, sea and ocean) because during use it has been incorporated into products, or consumed by households or livestock. It is calculated as the difference between total use and total supply; thus, it may include losses due to evaporation occurring in distribution and apparent losses due to illegal tapping as well as malfunctioning metering. (EDG)

Water Losses in Distribution: The volume of water lost during transport through leakages and evaporation between a point of abstraction and a point of use, and between points of use and reuse. Water lost due to leakages is recorded as a return flow as it percolates to an aquifer and is available for further abstraction; water lost due to evaporation is recorded as water consumption. When computed as the difference between the supply and use of an economic unit, it may also include illegal tapping. (EDG)

Water Returns: Water that is returned into the environment by an economic unit during a given period after use. Returns can be classified according to the receiving media (water resources and sea water) and to the type of water, such as treated water and cooling water). (EDG)

Water Stress: Level of the ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after considering environmental water requirements.

Water Supply: Water leaving/flowing out from an economic unit. Water supply is the sum of water supply to other economic units and water supply to the environment. (EDG)

Water Use Efficiency: The value-added of a given major sector divided by the volume of water used

Water Use from the Environment: Water abstracted from water resources, seas and oceans, and precipitation collected by an economic unit, including rainfed agriculture. (EDG)

Water Use within the Economy: Water intake of one economic unit, which is distributed by another economic unit. (EDG)

Water Use: Water intake of an economic unit. Water use is the sum of water use within the economy and water use from the environment. (EDG)

Chapter III
Methodology

Chapter III
Methodology

The important role of water in development is widely recognized. Thus, it is not surprising to find that water is very high in the national and international development agenda including several international agreements specifying targets on water supply and sanitation. The most notable recognition of the integration of water is SDG 6 – clean water and sanitation access. Access to clean energy, water, proper sanitation and food is essential for well-being, poverty reduction and sustainable development (Weitz et al 2014, Waage et al 2010 and FAO, 2014)[2]. It has been projected that the demand for freshwater will increase by 30 per cent, energy by 50 per cent and food by 40 per cent until 2030 in comparison to the current demand due to cumulative effects of population growth and mobility, economic development, urbanization, cultural and technological changes and climate change. Water is an integral input to enhance agricultural productivity and food production.

Waage et al (2010) argued that the dissemination of groundwater pumping practices may also threaten the depletion of water resources, aquifers and ventures. The agriculture sector also needs energy from cultivation to harvesting, and for distribution of agriculture products (FAO 2011)[3]. Similarly, access to energy plays a vital role in providing clean water in many remote locations. Water/sanitation, food and energy goals are interlinked. Thus, monitoring the nexus between these different sectors emerged as a key development challenge (Smajgl et al 2016)[4].

In a recent report examining the 'synergies' between SDGs, Marianela et al (2018)[5] argued that their approach confirms the general belief that SDG 6 (water) has the highest number of potential synergies (a total of 124). Thus, achieving the water targets may make it easier to achieve other SDG targets.

The System of Environmental-Economic Accounting for Water (SEEAW) provides a conceptual framework for organizing the hydrological and economic information in a coherent and consistent manner. The SEEAW framework is an elaboration of the handbook 'Integrated Environmental and Economic Accounting 2003' (United Nations et al. 2003) – commonly referred to as SEEA-2003. SEEA 2003 describes the interaction between the economy and the environment and covers the whole spectrum of natural resources and the environment.

3.1 Objective and Features of the SEEAW

The SEEAW has been developed to standardize concepts and methods used in water accounting. SEEAW provides a conceptual framework for organizing economic and hydrological

[2] Weitz, N.; Nilsson, M.; Davis, M. A nexus approach to the post-2015 Agenda: Formulating integrated Water, Energy and Food SDGs. SAIS Rev. Int. Aff. 2014, 34, 37–50. | Waage, J.; Banerji, R.; Campbell, O.; Chirwa, E.; Collender, G.; Dieltiens, V.; Patcharanarumol, W. The Millennium Development Goals: A cross-sectoral analysis and principles for goal setting after 2015. Lancet and London International Development Centre Commission. Lancet 2010, 376, 991–1023. | Food and Agriculture Organization of the United Nations (FAO). The Water-Energy-Food Nexus: A New Approach in Support of Food Security and Sustainable Agriculture; FAO: Rome, Italy, 2014.

3 Food and Agriculture Organization of the United Nations (FAO). The State of the World's Land and Water Resources for Food and Agriculture (SOLAW)—Managing Systems at Risk; FAO: Rome, Italy, 2011.

[4] Smajgl, A.; Ward, J.; Pluschke, L. The water–food–energy Nexus—Realizing a new paradigm. J. Hydrol. 2016, 533, 533–540.

[5] Marianela Fader, Colleen Cranmer, Richard Lawford and Jill Engel-Cox, "Toward an Understanding of Synergies and Trade-Offs Between Water, Energy, and Food SDG Targets," Frontiers in Environmental Science | www.frontiersin.org, November 2018 | Volume 6 | Article 112.

information allowing a coherent analysis/assessment of the contribution of water to the economy and the impact of the economy on water resources. Furthermore, it also elaborates the SEEA-2003 framework to include all aspects related to water.

Although, both the SEEA-2003 and the SEEAW are satellite systems of the 1993 SNA[6], there are two features that distinguish the SEEA-2003 and the SEEAW from other information systems about the environment.

First, SEEA-2003 and SEEAW directly link environmental data and, in the case of SEEAW water data, to the economic accounts through a shared structure, set of definitions and classifications. The advantage of SEEAW is that it provides a tool to integrate environmental-economic analysis and to overcome the tendency to divide issues along disciplinary lines, in which analyses of economic issues and environmental issues are carried out independently of one another.

Second, SEEA-2003 and SEEAW cover all the important environmental-economic interactions, a feature that makes it ideal for addressing cross-sectoral issues such as integrated water resource management. It is not possible to promote Integrated Water Resource Management (IWRM) from the narrow perspective of managing water resources; rather a broader approach that encompasses economic, social and ecosystem aspects is needed. As satellite accounts of the SNA, the SEEA and SEEAW are linked to a full range of economic activities with a comprehensive classification of environmental resources. The SEEA includes information about all critical environmental stocks and flows that may affect water resources and that may be affected by water policies.

The SEEAW includes as part of its standard presentation the following information:

. Stocks and flows of water resources within the environment;
. Pressures of the economy on the environment in terms of water abstraction;
. Emissions added to wastewater and released to the environment or removed from wastewater;
. The supply of water and the use of water as input in the production process and by households;
. The reuse of water within the economy;
. The costs of collection, purification, distribution and treatment of water, as well as the service charges paid by the users;
. The financing of these costs, that is, who is paying for the water supply and sanitation services;
. The payments of permits for access to abstract water or to use it as a sink for the discharge of wastewater;
. The hydraulic stock in place, as well as investments in hydraulic infrastructure during the accounting period.

The SEEAW emphasizes the importance of deriving indicators from the accounting system rather than from individual sets of water statistics. The SEEAW is an important tool for policy makers as it provides them (a) with indicators and descriptive statistics to monitor the interaction

[6] They have a similar structure to the 1993 SNA and share common definitions and classifications. They provide a set of aggregate indicators to monitor environmental-economic performance, both at the sectoral and macroeconomic level, as well as a detailed set of statistics to guide resource managers toward policy decision-making.

between the environment and the economy, and progress towards meeting environment goals; and (b) with a database for strategic planning and policy analysis to identify more sustainable development paths and the appropriate policy instruments for achieving these paths. The SEEAW extends the SEEA-2003 by providing a set of standard tables that countries are encouraged to compile using harmonized concepts, definitions and classifications. This is in line with the United Nations Statistical Commission's decision, upon recommendation of the United Nations Committee of Experts on Environmental-Economic Accounting[7], to elevate the SEEA-2003 to the level of a statistical standard by 2010 (United Nations, 2006c and 2006d).

The SEEAW has emerged as a useful tool in IWRM by providing the information system to feed knowledge into the decision-making process. The SEEAW can assist policy makers in taking informed decisions on:

- Allocating water resources efficiently.
- Improving water efficiency.
- Understanding the impacts of water management on all users.
- Getting the most value for money from investment in infrastructure.
- Linking water availability and use.
- Invest in water supply systems to reduce losses.
- Increase wastewater re-use and recycling, particularly in mining and agriculture.
- Use alternate sources of untreated freshwater and sea water (to protect the supply of potable water to households and services)
- Address cost discrepancies in the supply of water to different sectors
- Address over-extraction of groundwater by large mines
- Providing a standardized information system that harmonizes information from different sources is accepted by the stakeholders and is used for the derivation of indicators.
- Getting stakeholders involved in decision-making.

3.2 The SEEAW Framework

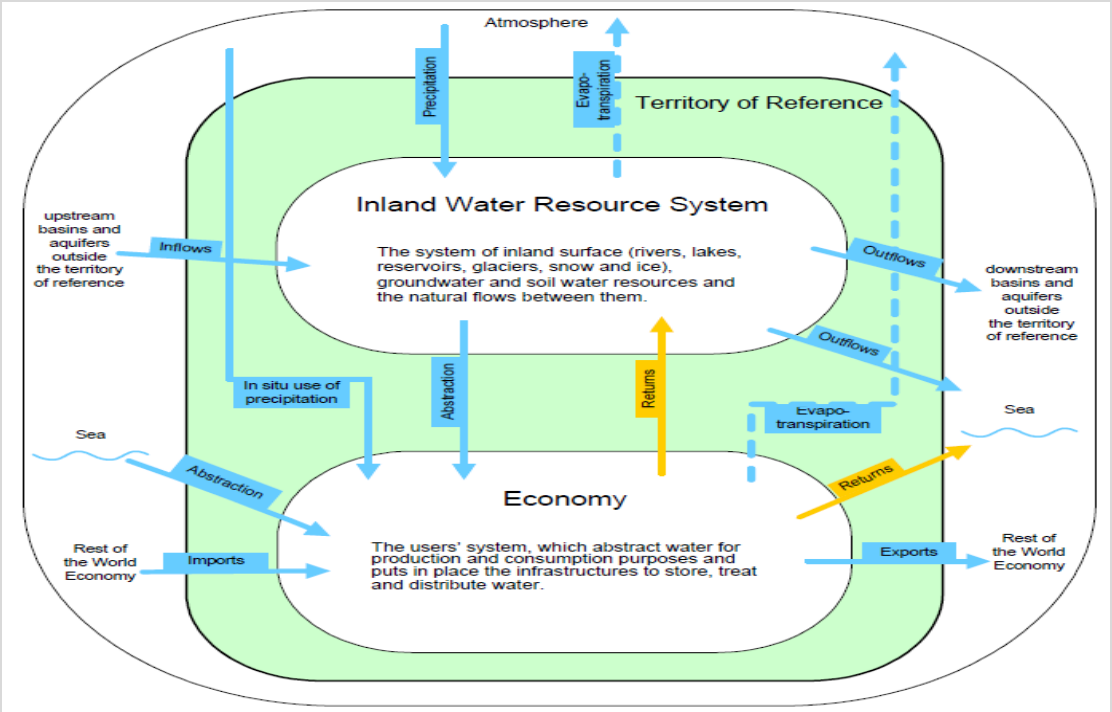
The System of Environmental and Economic Accounting for Water (SEEAW) provides a systematic framework for the organization of water information into an integrated information system to study the interaction between the environment and the economy. It also focuses on water as material input into production and consumption activities and as a 'sink' of waste.

A simplified SEEAW framework capturing the economy, the system of water resources and their interactions in presented in the figure below. The economy and the inland water

[7] The United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) was created by the United Nations Statistical Commission at its Thirty-fifth session in March 2005 (UN 2005). More information about the UNCEEA is available on the UNSD website http://unstats.un.org/unsd/envaccounting/ceea/default.asp.

resource system of a territory – referred to as 'territory of reference' - are represented in the figure as two separate boxes. The inland water resource system of a territory is composed of all water resources (i.e., supply of water) in the territory (surface water, groundwater, and soil water) and the natural flows between them. The economy of a territory consists of residents who abstract water for production and consumption purposes and put in place the infrastructure to store, treat, distribute, and discharge water (i.e., use of water).

Figure 3.1: Simplified SEEAW Framework Capturing the Flows between the Economy and Environment



Source: UNSD (2007)[8]

Water Supply: According to the simplified SEEAW the water supply is composed of (i) the inland water resource system[9]; (ii) flows from sea; and (iii) the atmosphere. Flows from the sea and atmosphere are considered outside the inland water resource system. These flows are also captured in the SEEAW accounting framework.

The water resources considered in the inland water resource system are rivers, lakes, artificial reservoirs, snow, ice, glaciers, groundwater and soil-water within the territory of reference. These resources form the water asset classification. The main natural inputs of water for these resources are precipitation and inflows from other territories and from other resources within the territory. The main natural flows that decrease the stocks of water are evapotranspiration, and outflows to other water resources within the territory and to other territories.

Water Use: There are different uses of the water in an economy. (i) It can physically remove

[8] UN Statistics Division (2007), "System of Environmental-Economic Accounting for Water," March 2007.

[9] The inland water resource system is composed of: (a) all inland water resources from which water is, or can be, abstracted; (b) water exchanges between water resources within the territory of reference (e.g. infiltration, runoff, percolation); and (c) water exchanges with water resources of other territories (i.e. inflows, outflows). Exchanges of water between the water resources are also referred to as natural transfers.

water from the environment for production and consumption activities or (ii) use water without physically removing it from the environment.

In the first case, the economy abstracts water from the inland water bodies or the sea, uses the precipitation through rain-fed agriculture or water harvesting, and uses water for hydroelectric power generation.

In the second case, the economy uses water for recreational and navigational purposes, fishing and other uses, that rely on the physical presence of water (in-situ uses) and, often, also on the quality of water.

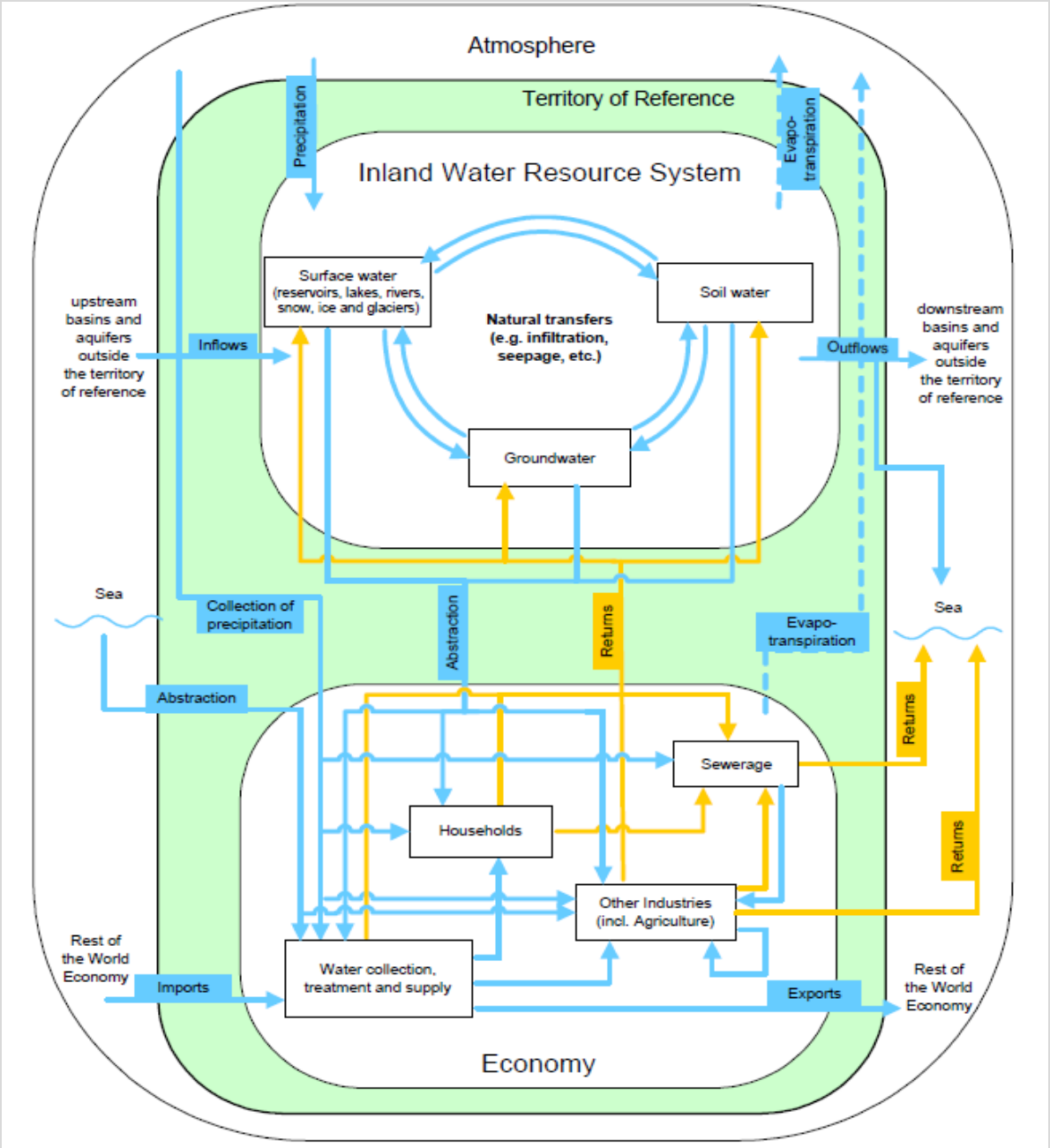
The economy returns water into the environment (i.e. in addition to abstracting water). As shown in the figure above, returns can be either to the inland water system or directly into the sea. Usually, return flows have a negative impact on the environment in terms of quality, as the quality of this water is often lower than that of abstracted water. Although returns to the water resource system alter the quality of the receiving body, they represent an input in the water system as returned water becomes then available for other uses. In other words, human activities decrease and increase the water stocks through abstraction and returns.

The simplified SEEAW framework presented in the figure 3.1 above has been extended below in figure 3.2.

Figure 3.2 elaborates the supply and use of Water. It elaborated the Inland Water System. It has also elaborated on the roles of the economic agents associated with water. In particular, the following roles have been identified:

- The industry is primarily involved in the collection, treatment and supply of water to households, industries and the rest of the world;
- The industry is primarily involved in the collection, treatment and discharge of sewage (sewerage);
- Other industries which use water as an input in their production processes;
- Households that use water to satisfy their needs or wants.

Figure 3.2: Detailed SEEAW Framework Capturing the Flows between the Economy and Environment



Source: UNSD (2007)

Box 1: Other Elements of SEEAW

- Monetary transactions related to water exchanges include: (a) costs of collection, treatment and supply of water and costs of sanitation services; (b) fees and taxes paid for water and sanitation services; (c) payments for access to the resource (e.g., water rights) as well as for discharging wastewater; and (d) the financing of these services (i.e., the sectors bearing the costs of services);
- Costs for environmental protection and resource management. They describe the economy's effort to prevent environmental degradation or eliminate part, or all, of the

effects after degradation have taken place. They include actual expenses incurred (current and capital) by industries, households and the government as well as the financing of these expenditure;

- Investments in infrastructure. They describe (a) the costs of new investment; (b) the depreciation of old investment; (c) the costs of maintaining the water-related infrastructure; and (d) the financing of these investments; and
- The emissions of pollutants into the environment. They allow for the identification of pressure on the environment by the various economic agents, namely industries, households and the government.

3.3 The SEEAW Accounts

As mentioned above, the SEEAW is a satellite account of SNA system and an amplification of the SEEA framework. The SEEAW consists of following types of accounts[10].

Asset Accounts

The type of accounts contains information on water resource assets measured mostly in physical terms. Asset accounts measure the stocks at the beginning and end of the accounting period and record the changes in stocks that occur during the period. They describe all enhancements and depletions of the stock due to natural causes (e.g., precipitation, evapotranspiration, inflows and outflows) and human activities (e.g., abstraction and returns). These accounts are particularly useful as they link water abstraction and return to the availability of water in the environment, thus allowing measurements of physical water pressure induced by the economy.

The purpose of asset accounts is to record the opening and closing stock of assets and the various types of changes in stock over an accounting period due to such factors as extraction (depletion), discovery, damages and catastrophic loss.

[10] There are 3 core accounts and 2 supplementary accounts. Most countries attempted to produce the 3 core accounts for water resources in a fiscal or calendar year.

Table 3.3: Basic Form of an Asset Account

Description	Unit of Measurement
Opening stock of resources	
Additions to stock of resources (a)	
Growth in stock	
Discoveries of new stock	
Upwards reappraisals	
Reclassifications	
Total additions to stock	
Reductions in stock of resources (b)	
Extractions	
Normal loss of stock	
Catastrophic loss	
Downwards reappraisals	
Reclassifications	
Total reductions in stock	
Closing stock of resources (c = a -b)	
Revaluation of the stock of resources *	

Physical Supply and Use Tables (PSUT) and Emission Accounts

The PSUT accounts bring together accordance with the SNA common framework, hydrological data on the volume of water used and discharged back to the environment by the economy as well as the number of pollutants added to water. Incorporation of the physical information of water in the accounting framework helps checks and balances in the hydrological data and produces a consistent data system from individual sets of water statistics often collected independently by different line ministries responsible for designing targeted policies. Moreover, the physical supply and use tables provide information on the volumes of water exchanged between the environment and the economy (abstractions and returns) and within the economy (supply and use within the economy). Please see Annex 1 for details on the Physical Supply and Use Table.

Figure 3.3: Flows between the Economy and Environment

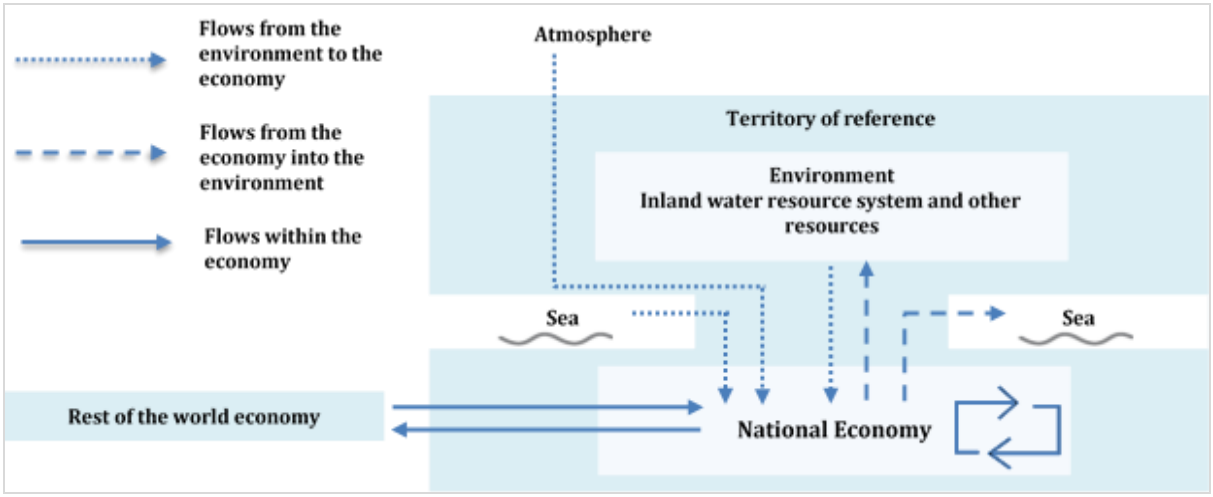
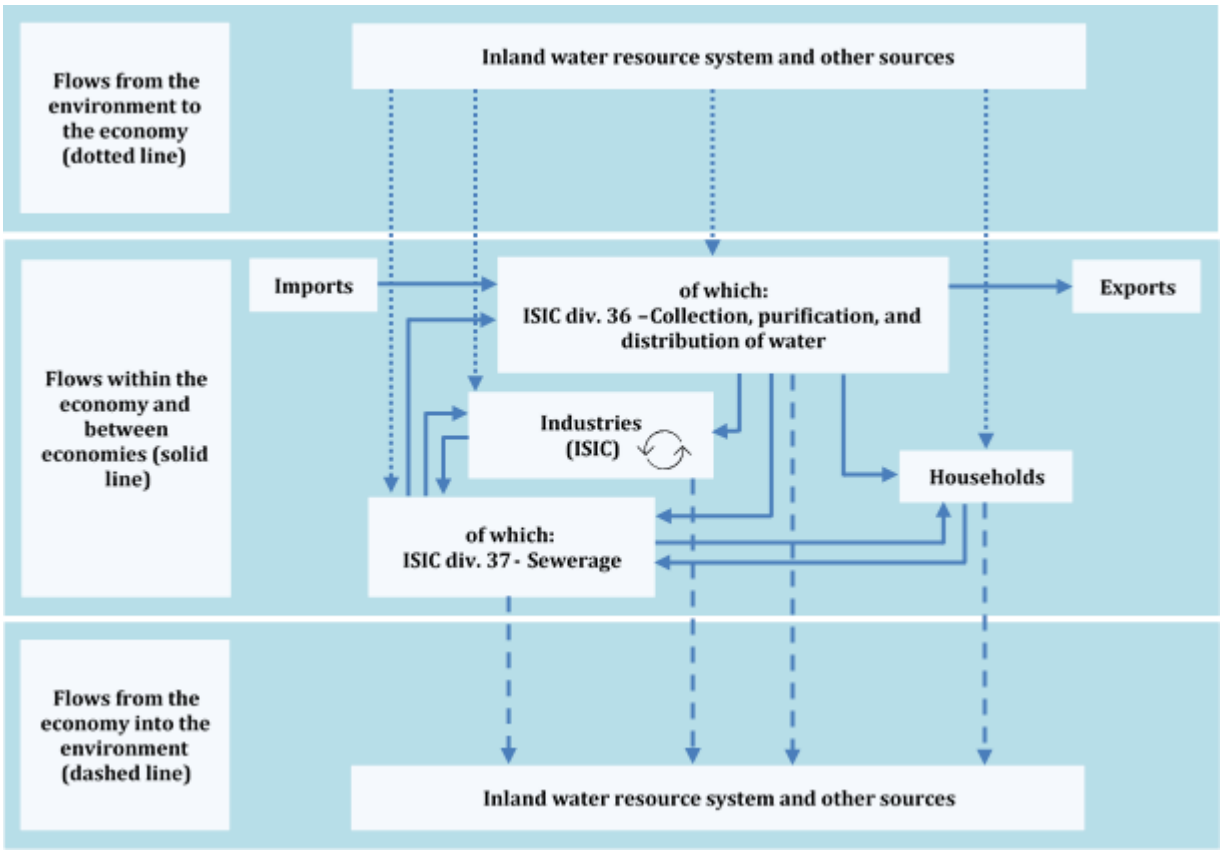


Figure 3.4: Main Flows within the Inland Water Resource System and the Economy



Source: UNSD (2007)[11]

Emission accounts contain information by economic activity and households on the number of pollutants that are added to or removed from water during use (by treatment processes).

[11] UN (2012), 'System of Environmental-Economic Accounting for Water', United Naton, New York, 2012, Department of Economic and Social Affairs, Statistics Division, ST/ESA/STAT/SER.F/100=

Valuation of Water Resources (Monetary Accounts)[12]

The valuation account comprises the valuation of water and water resources. When natural resources (e.g., water) are used in the production process, they are reflected in the final good or service produced. The price charged for the final product contains an element of rent – which implicitly reflects the value of the natural resource. Instituting this implicit element is the prime goal of valuing the stock of the resource. In the case of water use which is generally an open-access resource, this implicit element is often zero. However, as water is being Increasingly treated as an economic good, it is therefore expected that in the future the resource rent for water would be positive and thus value of the water stocks would be included in the balance sheets of a nation.

Hybrid and Economic Accounts

The hybrid and economic accounts combine the physical information recorded in the physical supply and use tables with the monetary supply and use tables prescribed in the SNA. These accounts are referred to as "hybrid" flow accounts to reflect the combination of different types of measurement units in the same accounts. In these accounts, physical quantities can be compared with the matching economic flows. These accounts also include:

- Information on the costs associated with water use and supply such as water abstraction, purification, distribution, and wastewater treatment.
- Information on financing – the amount users pay for the services of wastewater treatment, for example, and the extent these services are subsidized by the government and other units.

Using the information of cost and investment, hybrid accounts are used for cost-recovery policies and water-allocation policies. It can also be compiled for activities aimed at the protection and management of water resources so as to obtain information on the national expenditure and financing by industries, households and the government.

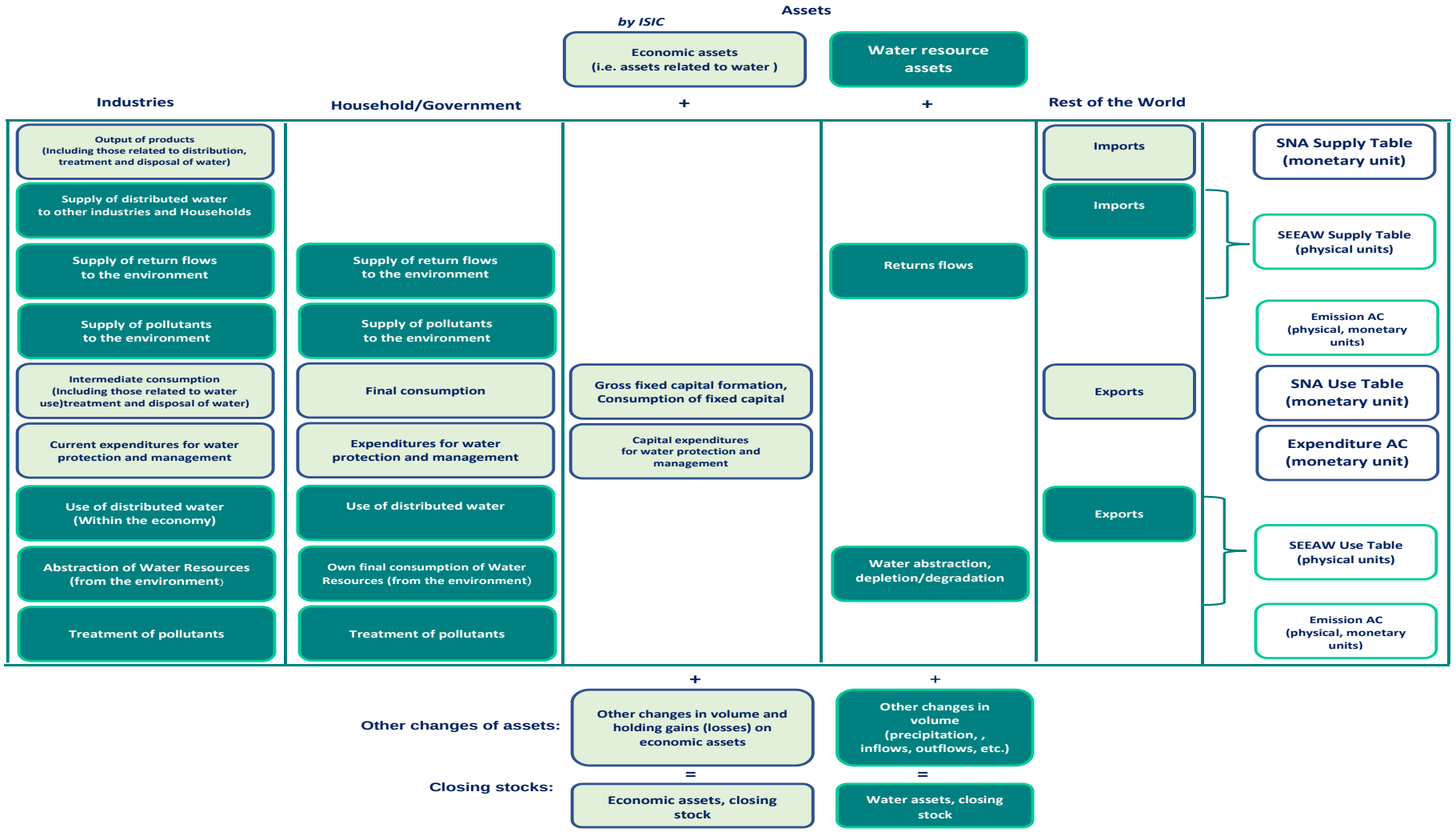
Quality Accounts

This account captures the quality of the stock of water. Quality accounts They show the stocks of certain qualities at the beginning and end of an accounting period. Since it is generally difficult to link changes in quality to the causes that affect it, quality accounts describe only the total change in an accounting period, without further specifying the causes. It should be noted that the quality accounts are still experimental and there is yet to be agreement on a standard way of compiling them.

The schematic description of the SEEAW framework is shown below. The framework in figure 2.5 can also be presented in a matrix form. The matrix presentation is commonly referred to as the National Accounting Matrix including Water Accounts (NAMWA). It should be noted that NAMWA is not a different framework rather an alternative presentation of the information contained in the SUTs presented in the figure below.

[12] The valuation of water resources is included in the SEEAW because of its policy relevance. However, since there is yet to be agreement on how to value water, the SEEAW only presents valuation techniques commonly used in economic analyses and their relationship with SNA and discusses the features of the different techniques.

Figure 3.5: SEEAW Framework (SEEAW and SNA Combined)



3.4 Approach

Current assessment draws all outcomes based on the United Nations System of Environmental-Economic Accounting 2012 Central Framework (SEEA-CF). The SEEA-CF is a multi-purpose conceptual framework that describes quantitatively the interaction between the economy and the environment, as well as the stocks and changes in stocks of environmental assets. It enables the integration of economic and environmental information which will allow us to see the links and relationships between environmental quality and economic well-being – insights that might be invisible when we look at economic and environmental data separately. Adopted as an international statistical standard by the United Nations Statistical Commission, the SEEA-CF also uses an agreed set of standard concepts, classifications, definitions, accounting principles, and tables which allows for comparison of the accounts and indicators between countries.

Three main accounts are discussed in the SEEA-CF, namely: (1) the asset accounts, also known as stock accounts, which record the stocks and changes in stocks of environmental assets, such as water resources, (2) the flow accounts, which measures the flows of water, energy and material from the environment to the economy and vice versa, in both physical and monetary flows; and, (3) the environmental activity accounts which focuses on environmental goods and services, as well as expenditures on environmental protection and resource management. This report on Bangladesh Water Account primarily focuses on three core accounts for the fiscal year 2021-2022, which are:

- Water Asset Accounts (WAA)
- Physical Supply and Use Table (PSUT) of Water Resources
- Monetary Supply and Use Table (MSUT) of Water Resources

3.5 Data Sources and Estimation

Since constructing the above three accounts for Water Resources is a heavy data-demanding exercise, the primary focus has been to identify data requirements, data sources and their readiness for the current exercise.

Sources of Data

The study has compiled data from different sources for different elements of flow accounts for the fiscal year 2021-2022. This section briefly illustrates all the secondary sources and agencies from where use and supply data has been collected through consultation with relevant stakeholders. Stakeholder consultations were organized to present data collection template, discussion on the methodology and ready availability of data. Almost all organizations involved in Water related activities participated in the consultation workshops. The compilation teams (at BBS and CEGIS) expected that the 3 Water Accounts may be developed from the agency data. Their first responses were that most of data are available. However, later they realized that the data collected by them are not ready for the compilation of the Water Accounts. Thus, the compilation team adopted an approach to supplement the agency data with data from international (i.e. mainly international multi-lateral agencies) and national sources (i.e. research reports and publications) to produce the Bangladesh Water Accounts. Following points highlight some key features of the data.

1. **WASAs and BBS for Urban and Rural Water Supply**: In the case of Bangladesh, four authorities are responsible for managing the urban water supply and sanitation. These are Dhaka WASA, Chattogram WASA, Rajshahi WASA and Khulna WASA. Hence, the water supply amount to the city dwellers by these authorities was collected from their respective annual reports for 2021-2022. Additionally, the study also incorporated the records (estimated value) on the rural water supply from the ***Household Based Environmental Survey 2024*** at household level conducted by BBS, which is yet to be published and data on treated wastewater for the industrial sectors was retrieved from the ***Environmental Protection Expenditure, Resource and Waste Management Survey 2022***, also published by BBS.
2. **BADC for Irrigation Area**: The irrigation data was collected from the ***Minor Irrigation Survey Report*** of Bangladesh Agricultural Development Corporation (BADC), which is primarily responsible for input supply, irrigation management and capacity development for the rural farmers. In this regard it is important to note that data for 2021-2022 is still not available Hence, the study utilized data from the previous year, which is 2020-21. Irrigation data was further validated with the data outlined in ***Yearbook of Agricultural Statistics 2023*** to estimate the water usage in the agriculture sector.
3. **FAO-AQUASTAT for Total Renewable Water Resources**: The total renewable water resources and the environmental flow requirements of Bangladesh were collected from the AQUASTAT (2021) including surface water and ground water data. The AQUASTAT is FAO's global water information system that collects, analyzes, and disseminates data and information by country.
4. **Secondary Literature**: Secondary literature was extensively used to estimate and derive data of respective industries, particularly the agriculture and RMG sectors. To have the primary data on industrial usage, an institutional survey will be needed for more accurate estimation.
5. **Abstraction for Own Use**: Given availability, it was only possible to estimate the water abstraction for the agriculture sector. In this regard, the irrigation area (ha) has been multiplied by the water demand for each hectare. Biswas and Mandal (1993) estimated

that water requirements are 11,500 m^3 per hectare (ha) of Boro rice.[13] Since this is a very old estimation, the study has considered the latest research on the water requirement for Boro rice which amounts to 1600 liter of water for the production of 1 kg, particularly in the north-western region of Bangladesh.[14] The study also considered other relevant crops that are consuming water under irrigation purposes (see Appendix 2). In the case of industrial water use, the water footprint of RMG and agro-processing sectors has been taken into consideration. Due to the unavailability of a full fledge data on other water-intensive industries such as mining, and electricity could not be adequately calculated. Thus, a second-best scenario has been drawn with the existing data.

6. **Return Flows of Water**: This study could not calculate the return flows of water due to the unavailability of data on water use efficiency.

[13] Biswas, M R and M A S Mandal. 1993. Irrigation management for crop diversification in Bangladesh. Dhaka, Bangladesh: University Press Limited.

[14] https://businesspostbd.com/back/1606-litres-of-water-needed-to-produce-1kg-boro-rice-2022-01-15

Chapter IV

Water Accounts of Bangladesh

Chapter IV
Water Accounts of Bangladesh

This chapter primarily presents the results pertaining to the two principal components of Bangladesh's water accounts: the physical flow accounts for water resources and the monetary accounts. The physical flow accounts emphasize the quantitative assessment of water assets, typically measured in cubic kilometres, while the monetary accounts provide a valuation of these assets in financial terms, expressed in billions of Bangladeshi Taka (BDT). The results detailed in the following two sections have been obtained using the methodologies described in the preceding chapter.

4.1 Physical Flow Accounts for Water Resources

The physical flow accounts for water resources describes the flows of water to and from the environment and the economy, measured in terms of volume (cubic kilometres). The accounts cover the entire process of water supply and use – from the initial abstraction of water from the environment into the economy, to the flows within the economy done by the different industries and households, and finally, return flows from the economy back to the environment. The flow accounts table is divided into sections that further elaborate the flows of water between the environment and the economy. The five components are defined as follows:

- Abstraction of water from the environment
- Distribution and use of abstracted water
- Flows of wastewater and reused water
- Return flows of wastewater to the environment
- Evaporation, transpiration, and water incorporated into products

In addition, the flow accounts are also divided into two parts: the physical supply table and the physical use table. The supply table, as its name implies, focuses on where the water comes from. On the other hand, the use table focuses on who uses or receives the water. The economic unit that performs the water withdrawal from the environment is the user and the abstracted water is either consumed by the same unit or is distributed to be used by other sectors. Once water is no longer needed by the user, it is released back and recorded as used by the environment. However, this study could not either collect relevant use data for suggested sectors or estimate due to the unavailability of required data. For instance, it was challenging to trace the flow of wastewater and evapotranspiration according to the different economic activities and sectors (e.g., mining, power generation etc.). For completeness, an industry survey (preferred) and key informant interviews (KIIs) with key relevant stakeholders (second best solution) will be required to gather necessary records on water usage.

Physical Supply Table

Ideally, water accounts should encompass all the water resources of the country. However, this study aims to initiate the development of water accounts in Bangladesh by assessing the currently available data. Thus, it is not feasible to consider all resources. The data in the supply table in this study is limited by the scarcity of available data, as there is no comprehensive database detailing the exact amount of water supplied by industries or the flow from the environment. However, available data (i.e. aggregate and not very detailed) have been collected. For instance, 58.91 km^3 of water is supplied for irrigation purposes. In the manufacturing sector, only the RMG (Ready-Made Garments), and agro-processing have been considered, accounting for 2.94 km^3 of water usage. For electricity generation, 1.5 km^3 of water is supplied to the 140 power plants. Additionally, the treated water (and distributed) by four WASAs, equal to 1.46 km^3, is passed into the distribution system. This study aims to initiate the development of water accounting and will be continually updated as more comprehensive data become available.

Physical Supply Table (Km³ or Billion Cubic Meter)	**Industries by ISIC**							**Household**	**Flows from the rest of the world (Imports)**	**Flows from the environment**	**Total Supply**
	Agriculture, Forestry, & Fishery	**Minning &Quarrying**	**Manufacturing**	**Electricity, gas, steam, air conditioning supply**	**Water Collection, treatment & Supply**	**Sewerage**	**Other Industries**				
	ISIC A	**ISIC B**	**ISIC C**	**ISIC D**	**ISIC 36**	**ISIC 37**					
1.Sources of Abstracted Water											
Inland Water Resources											
of which Surface Water										46.89	46.89
of which Groundwater										21.85	21.85
Other Water Sources											
Total Supply Abstracted Water										68.74	68.74
2.Water											
For Distribution					1.46						1.46
For Own Use	58.91	0.021	2.94	1.50	3.66		0.065				67.09
3. Wastewater and reused water											
Wastewater to treatment	0.0000159		1.0881	0.0212		0.18	0.065				1.60
Own treatment of wastewater											
Total wastewater and reused water	0.0000159		1.0881	0.0212		0.18	0.065				1.60
4. Return flows of water											

Physical Supply Table (Km³ or Billion Cubic Meter)	**Industries by ISIC**							**Household**	**Flows from the rest of the world (Imports)**	**Flows from the environment**	**Total Supply**
	Agriculture, Forestry, & Fishery	**Minning &Quarrying**	**Manufacturing**	**Electricity, gas, steam, air conditioning supply**	**Water Collection, treatment & Supply**	**Sewerage**	**Other Industries**				
	ISIC A	**ISIC B**	**ISIC C**	**ISIC D**	**ISIC 36**	**ISIC 37**					
To Inland water resources											
To other sources											
Total Return Flows											
of which losses in distribution											
5. Evaporation of abstracted water, transpiration, and water incorporated into products											
Total water evaporated, transpired and incorporated into products											
6.Total Supply	58.91	0.021	2.94	1.50	5.12	0.18	0.065			68.98	137.3

Note: Grey cells are null by definitions, Blank cells indicate zero values for respective sources and industries

BBS, BADC, FAO-AQUASTAT, BAPA, DWASA, RWASA, KWASA, CWASA, PDB

Physical Use Table

The physical use table complements the supply table by detailing water usage across different industries and institutions. Surface water is primarily used for consumptive and non-consumptive purposes. Non-consumptive uses include transportation, fishing, and crop irrigation, and consumptive uses include human or industrial activities. Among these, crop irrigation is the largest user of surface water, estimated at 42.80 km³. Groundwater usage for crop irrigation is estimated at 16.11 km³.

There is no denying the fact that the unavailability of data on other water-intensive industries such as mining, electricity, and manufacturing is a major concern. However, some of the data were collected through consultation with respective stakeholders though a full scenario of water usage in those sectors is still missing (please see appendix 1 and 2 for data sources). Additionally, data discrepancy among the inter-agencies also makes the estimation process difficult. Considering those difficulties, a baseline scenario of water usage in the industrial sector has been estimated. In power generation, water is being used as a substantial input across 140 power plants in the country where the Karnafuli Hydropower Station is utilizing the gravitational service of water. The total usage in this sector amounts to 1.5 km³. For the manufacturing industry, which also requires significant water consumption, only the RMG (Ready-Made Garments) and agro-processing sectors have been considered. In these sectors, 0.59 km³ of water is sourced from surface water, while 2.36 km³ is drawn from groundwater sources.

DWASA, CWASA, KWASA, and RWASA are responsible for treating and supplying water to households and other users. These organizations collect water from rivers (also groundwater), treat it in their water treatment plants, and then supply it through their distribution systems. The water sources for the city's supply are both groundwater and surface water. In Dhaka, there are five water treatment plants: Chandni Ghat Water Works, Saydabad Phase 1, Saydabad Phase 2, Padma Water Treatment Plant, and the Saver Vakurta Well Field. These plants treat water from the Shitalakhiya, Buriganga, and Padma rivers to supply the city. CWASA also operates three surface water treatment plants and one groundwater treatment plant. Other WASAs are either planning or constructing their water treatment facilities. Although the exact amount of water consumed by households maybe difficult to trace, a derived value of 5.12 km³ from the *household based environmental survey 2024* at household level, has been used for both surface and groundwater treatment in the tables.

For distribution, 1.46 km³ and for own use, 67.09 km³ of water is used by different industries, consistent with the supply table. The total supply is 137.3 km³, ensuring that the supply matches the use.

Unlike other environmental assets, such as land or timber resources that are subject to slow natural changes, water is continually flowing through the processes in the hydrological cycle such as precipitation, evaporation, infiltration and run-offs. Water accumulation and availability depend heavily on weather patterns. During the wet season, water recharge increases, whereas, in the dry season, it decreases. Consequently, the physical value of water use, and supply can vary seasonally.

Furthermore, unlike mineral or energy resources that are highly regulated, water is easily accessed, abstracted and returned to the environment by different economic units – some of which might be unaccounted for.

The data used in this study are sourced from readily available statistics within the current system and will be continually updated as new data become available. There is potential to re-evaluate this data based on surveys with the help of relevant authorities such as the Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), and Bangladesh Agricultural Development Corporation (BADC), which provide the latest and most accurate data on rainfall, evapotranspiration, and similar metrics.

Physical Use Table (km^3 or Billion Cubic Meter)	Industries by ISIC							Households	Accumulation	Flows to the rest of the world (Exports)	Flows to the environment	Total Use
	Agriculture, Forestry, & Fishery	Mining & Quarrying	Manufacturing	Electricity, gas, steam, air conditioning supply	Water Collection, treatment & Supply	Sewerage	Other Industries					
	ISIC A	ISIC B	ISIC C	ISIC D	ISIC 36	ISIC 37						
1. Sources of Abstracted Water												
Inland Water Resources												
of which Surface Water	42.80		0.59	1.50	2.00							46.89
of which Groundwater	16.11	0.021	2.36		3.11		0.065					21.85
Other Water Sources												
Total Water Use Abstracted	58.91	0.021	2.94	1.50	5.12	0.18	0.065					68.74
2. Water (use)												
For Distribution												
For Own Use	58.91	0.021	2.94	1.50				5.12				68.49
Total	58.91	0.021	2.94	1.50				5.12				68.49
3. Return flows of water												
Total Return Flows												
4. Evaporation of abstracted water, transpiration, and water incorporated into products												
Total water evaporated, transpired and incorporated into products												
Total Supply	58.91	0.021	2.94	1.50		0.18	0.065	5.12			68.98	137.3

Note: Grey cells are null by definitions, Blank cells indicate zero values for respective sources and industries

Sources: BBS, BADC, FAO-AQUASTAT, DWASA, RWASA, KWASA, CWASA, BAPA, BGFCL, MPEMR, BCMCL, PDB

4.2 Asset Accounts

As mentioned above, the SEEAW is a satellite account of SNA system and an amplification of the SEEA framework. Following that, the total volume of water resources for FY 2021-2022 has been derived where opening stock emerges to 1227.032 Km^3 or Billion Cubic Meter (BCM) and the closing stock accounts for 1369.40 Km^3. The estimation further reveals that 68.74 Km^3 amount of water has been abstracted for economic activities. The details have been spelled out as follows:

Table 4.1: Water Asset Account of Bangladesh for FY 2021-2022

Sources of Water Resources	Total Renewable Water Resources		Total Volume (Km^3)
	Surface Water	Groundwater	
(A) Opening Stock	1205.91	21.122	1227.032
Addition to Stocks			
(B) Returns (from Economy)			68.74
(C) Precipitation			393.42
(D) Inflows from other territories			1122.00
(E) Discoveries of water in aquifers			-
(F) Other sources addition to stock			-
(G) Total additions to stock			1584.16
Total Stock (A+G)			2811.19
Reductions in Stock			
(H) Abstractions (to Economy)			68.74
(I) Evaporation and evapotranspiration			-
(J) Outflows to the other territories			0.057
(K) Outflows to the sea (Bay of Bengal)			1373
(L) Reduction from Other usage			-
(M) Total reductions in stock			1441.79
Closing Stock (Total Stock-M)			1369.40

Sources: FAO-AQUASTAT 2021

4.3 Monetary Accounts

Monetary Supply and Use Table for Water

The monetary supply and use table for water measures the monetary flows of water-related products in an economy between different economic units. It gathers the entire production of water-related products to come up with the total supply of natural water and sewerage services. The total supply of water must be equal to the total intermediate consumption and final use. Table 3.2 captures the monetary supply with a brief explanation below. The monetary water account table has been developed for fiscal year 2023 (unlike the other two accounts which refer to FY 2021/22). This is due to the availability of data for FY 2023 (i.e. BBS and an input-output table for Bangladesh for 2023). The relevant rows are the water supply and sewerage for supply and their usage by the major industries and institutions. The value of the total supply of water has been estimated at Tk 100 billion and sewerage of Tk 5 billion in 2023. On the other hand, the users of the households account for about 80 percent of the water and sewerage.

Table 4.2: Monetary Supply and Use Table for Water in Bangladesh

Unit: Billion Tk

	Industry										Actual Final Consumption		
	Agriculture, fishing and forestry	**Mining and quarrying**	**Manufacturing**	**Electricity and Gas**	**Water Supply**	**Sewerage**	**Services**	**Total Industry**	**Rest of the World**	**Taxes less Subsidy on products and margins**	**Households**	**Government**	**Total**
Total output and supply	8,936	1,020	24,890	662	100	5	39,625	75,237	8,005	31,166			114,409
of Which:													
Natural water (CPC 1800)					100	0		100					100
Sewerage (CPC 941)						5		5					5
Intermediate Use and Final Use													
Natural water (CPC 1800)	0	1	3	0	0	0	18	23			78	0	100
Sewerage (CPC 941)	0	0	0	0	0	0	1	2			3	0	5
Other Products	8,936	1,020	24,890	662	100	5	39,625	75,237	5,909		30,718	2,544	114,409

Note: Gray cells are null by definition.

Source: Estimated based on BBS Data and Bangladesh Input-output Table 2023

Screening the monetary account of Bangladesh, reveals that the total economic output of water supply in the economy amounts to Tk. 114,409 billion**,** which is the total supply across all sectors. The table further informs us of the total economic value produced by water usage in each sector. The largest contributor is the services sector, with 39,625 billion Tk, followed by manufacturing at 24,890 billion Tk**.** The smallest contributions are arising from sewerage **(**5 billion Tk**)** and Water Supply **(**100 billion Tk**).**

Intermediate Use: The table outlines how various products like natural water and sewerage are used across sectors. For example, most of the natural water is used by the Services and Agriculture sectors.

Final Consumption: This includes the final consumption by entities such as Households, Government, and the Rest of the World (through exports). A significant portion of final consumption comes from Households (which could reflect goods and services they purchase directly).

Taxes and Subsidies: The 31,166 billion Tk under Taxes less Subsidies could reflect indirect taxes or subsidies that affect the final prices of goods and services in various sectors.

Chapter V

Trend of Water Use Efficiency

Chapter V
Trend of Water Use Efficiency

5.1 Water Use Efficiency (WUE)

For sustainable water resource management, it is instrumental to estimate the Water Use Efficiency for any economy. In practice, it refers to the ratio of the output or value added by a particular sector in relation to the amount of water used in that sector. It measures how effectively water resources are utilized in the production or service processes, helping to evaluate sustainability and manage water recourses more efficiently.

5.1.1 Sectoral Trend in WUE

Water use efficiency is important in various sectors, particularly in agriculture, industry, and service, because it helps to ensure that water is used in a way that maximizes output while minimizing waste. It is also significant for tracking the SDG indicator 6.4.1 called change in water use efficiency. According to the FAO guideline, WUE will be estimated across three major sectors. The estimation mechanism in these sectors is illustrated as follows:

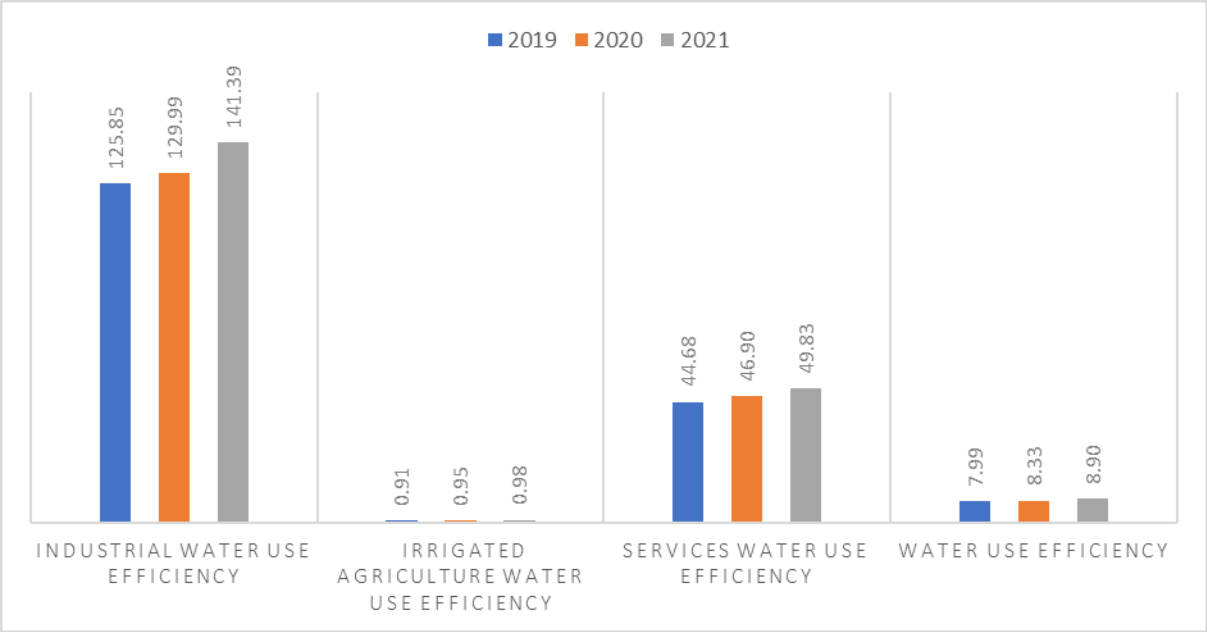
1. **WUE in Agriculture Sector (ISIC A)**:
    - This sector is comprised of irrigated agriculture, forestry and fishing.
2. **WUE in MIMEC Sector (ISIC B, C, D and F):**
    - MIMEC sector includes mining and quarrying; manufacturing; electricity, gas, steam and air-conditioning supply; and constructions.
3. **WUE in Service Sector (ISIC E and ISIC G-T):**
    - This sector covers all sub-sectors related to services.

The indicator is commonly measured by value/volume or USD/m^3.

Though this study did not estimate the overall WUE for Bangladesh due to the unavailability of data for Mining Industry Manufacturing Electricity and Construction (MIMEC) and Service sectors, earlier estimates from ***FAO AQUASTAT 2021***, will be useful to understand the baseline condition of economic productivity in water usage pattern. These estimates will further facilitate updating the later ones. Following figure shows the trend WUE across the sectors and focuses on the overall WUE in Bangladesh for the preceding years 2019,2020 and 2021.

Data compiled here reflects an upward trend of WUE across the sector where the highest efficiency was realized in the industrial sector amounting to USD 141.39/m^3 in 2021. On the contrary, WUE in the agriculture sector stands at USD 0.98/m^3. Overall findings convey the message that the economic efficiency of water resources is gradually improving in Bangladesh.

Figure 5.1: Trend of Water Use Efficiency (USD/m^3) across the Sectors in Bangladesh



Source: AQUASTAT 2021, FAO

5.1.2 Significance of Water Use Efficiency

- **Sustainability**: With water scarcity becoming a global issue, improving water use efficiency is key to sustainable resource management. It helps ensure that water supplies are sufficient for future generations.
- **Cost Savings**: For farmers and businesses, improving water use efficiency can reduce operational costs by using less water while achieving the same or better outputs. In agriculture, this could reduce irrigation costs, while in industry, it may lead to lower water bills.
- **Climate Resilience**: As climate change impacts water availability in many regions, enhancing water use efficiency helps businesses, agriculture, and cities adapt to drier conditions and ensure they have adequate resources to function.
- **Environmental Impact**: Efficient water use also means reducing the environmental impacts of water extraction. By using water more effectively, there is less need to extract water from rivers, lakes, and groundwater sources, which can help preserve ecosystems.

5.1.3 Improving Water Use Efficiency:

1. **Agriculture (ISIC A)**:
    - **Drip Irrigation**: This technique delivers water directly to plant roots, reducing evaporation and runoff, thereby improving WUE.

- **Soil Moisture Monitoring**: Using sensors to monitor soil moisture allows farmers to apply water only when needed, avoiding over-irrigation.
- **Drought-resistant Crops**: Growing crops that require less water helps improve WUE in water-scarce areas.

2. **MIMEC (ISIC B, C, D and F)**:
   - **Recycling and Reusing Water**: Many industries, such as textiles or paper manufacturing, can recycle and reuse water within the same process to improve efficiency.
   - **Water-efficient Technologies**: Implementing technologies that minimize water usage, such as closed-loop systems, can improve efficiency in industrial processes.

3. **Service Sector (ISIC E and ISIC G-T)**:
   - **Fixing Leaks**: Preventing and repairing leaks in water distribution systems can significantly improve WUE in cities.
   - **Public Awareness Campaigns**: Encouraging citizens to reduce water waste, like fixing leaking taps or using water-saving appliances, contributes to better overall water efficiency in this sector.

Water use efficiency is a crucial concept for sustainable resource management, especially in sectors that depend heavily on water. Whether in agriculture, industry, or municipal systems, improving WUE helps conserve water, reduce costs, and promote environmental sustainability. By applying more efficient technologies and practices, we can make the most of our limited water resources.

Chapter VI

Investment Scenario in Water Resources

Chapter VI
Investment Scenario in Water Resources

There are many consumptives' uses of water resources such as agriculture and industry, and many non-consumptives uses such as fisheries and navigation. Although the country is well endowed with water resources in terms of volume, its spatial and temporal variation causes shortages of resources among its competing users due to heightened demand arising from the increased development activities. Hence, it is instrumental for managing total renewable water resources efficiently. Considering this, the Government of Bangladesh invests every year in water resource sectors. In this connection, the Annual Development Program (ADP) plays as a mirror book that reflects policymakers' extent of emphasis on water resource management. This section briefly illustrates the public investment status in water sector where the following section explores the private investment scope in Bangladesh.

6.1 Public Investment in Water Sector

ADP is usually designed for chalking out the yearly investment allocation for 15 sectors (e.g. earlier this was 17 sectors) of Bangladesh from the national budget in accordance with the latest fifth-year plan. It is often believed a central element of the Government's short-term financial planning where priorities of the ADP are designed prioritizing the key focuses of the long-term and medium-term plans such as SDGs, and Bangladesh Delta Plan-2100. Every year the quantum of allocation in the ADP is amplified on the grounds of a particular national strategy in relation to eco-social and infrastructural development of the country, human resource development, reduction of poverty and enrichment of income. Table 4.1 shows the public investment trend in the water sector over (2020-24).

Table 6.1: Public Investment Trend in Water Sector of Bangladesh over Last Five Years (2020-2024)

(Million Taka)

Fiscal Year	Public Investment in Water Sector							
	ADP	Irrigation	Water Supply	Water Resources	Water in ADP (2+3+4)	Share of Water Sector in ADP (%)	GDP	Share of Water Sector in GDP (%)
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2019-20	2151130	15600	93840	56530	165972	7.70%	31705000	0.52%
2020-21	2092710	15600	96740	67090	179434	8.60%	35302000	0.51%
2021-22	2367930	14400	99740	59970	174108	7.40%	39717000	0.44%
2022-23	2460660	19750	102500	71880	194130	7.90%	44393000	0.44%
2023-24	2630000	23960	103660	65690	193318	7.40%	50480000	0.38%

Source: ADPs of 2020-2024, Planning Commission, GoB

Screening the above table 6.1 reveals that overall public investment in the water sector amounted to Tk. 165,972 million accounting for 7.7% of the ADP in FY 2019-2020 where it was only 0.52% of the GDP at that time. The share of the water sector in the successive years also

indicates a similar trend except for a sharp rise in FY 2020-21 covering 8.6% of the ADP. It further affirms that the coverage of the public investment never exceeded 8% of the ADP except FY 20-21. Though it is decisive to maintain a considerable share of investment in water resource management, improving the water use efficiency will need to be more emphasized. Aligning with this perspective, estimating the water use efficiency of Bangladesh will be crucial in the coming days.

6.2 Private Investment in Water Sector

In addition to public investment, the private sector plays a vital role in terms of water consumption and efficiency. Most of the investment related to water abstraction in this sector is mainly arising from the food and beverage industries for non-consumptive purposes. A recent industrial survey (SMI-2019) shows that both the food and beverage industries in the country combinedly contributed about 13.08% of Gross Value Added (GVA) amounting to Tk. 593,174 million. Water consumption occupies a significant involvement, particularly while producing bottled water and soft drinks. The water usage pattern varies significantly across the beverage industry earlier studies indicate that between 1.34 to 1.54 liter is required to produce per Liter beverage where 1 m^3 of water costs about Tk. 13 to 15 in the beverage industry. The water in the beverage industry is abstracted through its own operated tube wells and water treatment is done while effluents are discharged as claimed after treatment.

In terms of food production, two products considerably exploit water, which are noodles and instant cereals. It is found that on average, noodles' industry requires at least 12,114 cubic meters of water of giving an average of 1.1 kg of noodles per litre of water which translates to less than a litre of water per kg of noodles produced during 2017-19. For Instant cereal the respective numbers were: 5406 cubic meters, 3828 tons and 0.7 kg per litre of water indicating water use of 1.4 litres per kg of output. Instant cereals therefore more water intensive than noodles.[15] However, a full-fledge survey is required to understand the complete picture of water consumption pattern in this industry.

[15] Final Report, *Study on Developing Operation Shadow Price for Water to Support Informed Policy and Investment Decision Making Process 2021*, WARPO and CEGIS.

Chapter VII

OCEAN Account

Chapter VII
OCEAN Account

Ocean accounts refer to the integrated records or compiled information concerning ocean environment assets (e.g., extent/condition of mangroves), economic activity (e.g., sale of fish) and social conditions (e.g., coastal employment) to monitor or measure the progress towards the sustainable development of the ocean. Such integration of record interprets accounting not only in monetary value but also beyond the gross domestic product (GDP) which measures the contribution of the ocean to society and its progress in line with the Sustainable Development Goals (SDGs).

Components

According to Global Ocean Accounts Partnership (GOAP) 2022, ocean accounts integrate four key components:

Macro-economic accounts - from which economic measures such as GDP are derived, and from which legal, illegal, unreported, and unregulated activities can be accounted for.

Environmental-economic accounts that explain assets and flows, wastes, expenditures, taxes, and subsidies.

Ecosystem accounts which deal with the extent, condition, biodiversity, services, and value of ecosystems.

Structured data- on ocean beneficiaries, technology, governance, and management.

Framework

GOAP 2022 has designed a framework of ocean accounts to enhance the consistency, comparability and coherence of ocean-related maps, data, statistics, and indicators across social, environmental and economic domains. The design of the framework considers some international frameworks and standards concerning data and statistics such as System of National Accounts (SNA), The SEEA Central Framework (SEEA-CF), SEEA Ecosystem Accounting (SEEA-EA), National Spatial Data Infrastructure (NSDI) and Framework for the Development of Environment Statistics (FDES).

However, the framework describes:

- Interactions between the ocean economy and the ocean environment.
- The stocks and changes in stocks (flows) of ocean assets (natural capital) that provide benefits to people.
- The social and governance factors affect the status and condition of environmental assets and associated benefits.
- Guidance on ocean economy satellite accounting.

Figure 7.1: A Simplified Ocean Account Framework

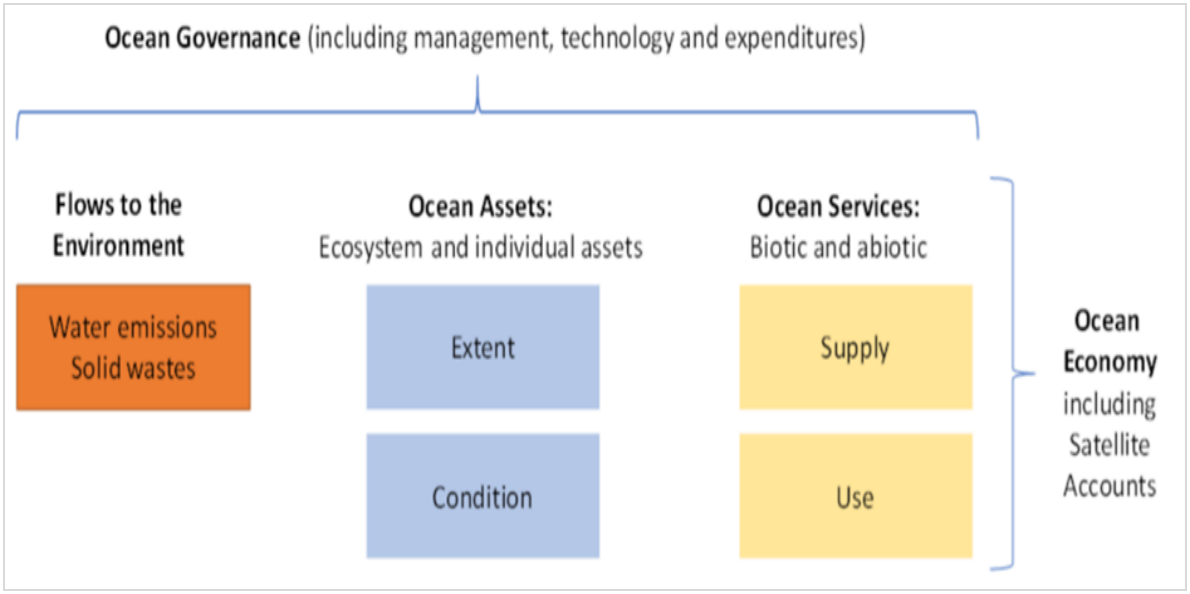


Table 7.1: Ocean Accounting in Bangladesh: Ocean Data and Information

Sectors	GDP (crore Tk)	Year	Source
Economic Measures			
Marine Fisheries	146911.5	2021 - 2022	FRSS and BER
Coastal Aquaculture	3.53	2022 - 2022	FRSS and BER
Coastal and marine tourism and recreation	78539.2	2016	Islam, M.W. and T. Sarker. 2021. Sustainable Coastal and Maritime Tourism: A Potential Blue Economy Avenue for Bangladesh. ADBI Working Paper 1293. Tokyo: Asian Development Bank Institute. Available: https://www.adb.org/publications/sustainable-coastal-maritime-tourism-potential-blue-economy-avenue-bangladesh
Sea Salt	3500	2022	BSCIC annual report 2022-2025
Crab Export	53.754	2022 - 2023	https://seafoodnetworkbd.com/mud-crab-farming-in-bangladesh-and-export-scenario
Total	150468.784		
Environmental Measures			
Sea Surface Temperature	23.32 to 28.24 degree Celsius	2023	GCOM-C/SGLI L3 Sea Surface Temperature Mean
Chlorophyll a content	-1.20 to 0.88 mg/m^3	2023	GCOM-C/SGLI L3 Chlorophyll a Mean
Sector	**Area**	**Year**	**Source**
Mangrove area	4582.7 sq km	2019	Land use data

Salt cultivation area	66,291 acres	2022	https://www.dhakatribune.com/bangladesh/309823/highest-salt-production-in-bangladesh-in-62-years, https://www.dailymessenger.net/country/news/11068#:~:text=M.,Belal%20Uddin%2C%20Banshkhali&text=During%20the%202022%2D2023%20season,15%20of%20the%20following%20year.
Crab Cultivation area	9,535 hectares.	2022	Department of Fisheries (DoF), https://businesspostbd.com/front/taste-for-crab-growing-2022-02-13
Coastal area	40309.1sq km		Integrated Coastal Zone Management Plan (ICZMP)
Coastal islands	4051.53 sq km	2005	Integrated Coastal Resources Database (ICRD)
Char or island area in Barishal and Chattogram division under Meghna Estuary	4359.46 sq km	2005, 2019	Integrated Coastal Resources Database (ICRD), 2005; Landsat Image 30m, Department of Forest (DoF), 2019
Social Information			
	Number		
Population resident within 10 km coastline	12.89 million	2020	OECD database 2020
Population resident within 100 km coastline	45.73 million	2020	OECD database 2020
Population in Coastal region	47.2 million	2022	Population and Housing Census 2022
Population Involved in crab farming	3 lakhs	2022	https://seafoodnetworkbd.com/mud-crab-farming-in-bangladesh-and-export-scenario

Sector	Number	Year	Source
People directly involved in salt industry	5 lakhs	2022 - 2024	
People indirectly involved in salt industry	25 lakhs	2022 - 2024	BSCIC annual report 2022-2024
Salt farmers (Number)	39,467 farmers	2022	https://www.dhakatribune.com/bangladesh/309823/highest-salt-production-in-bangladesh-in-62-years, https://www.dailymessenger.net/country/news/11068#:~:text=M.,Belal%20Uddin%2C%20Banshkhali&text=During%20the%202022%2D2023%20season,15%20of%20the%20following%20year.
Supply			
	Production (Metric Tons)		
Crab production	12,562	2020	DoF, https://businesspostbd.com/front/taste-for-crab-growing-2022-02-13
Salt production	22.33 Lakh	2022 - 2023	Bangladesh Small and Cottage Industries Corporation (BSCIC) annual report
Marine Fisheries	706030	2021 - 2022	Fisheries Resources Survey System (FRSS) and Biological Exploitation Rate (BER)
Coastal Aquaculture	16.98	2022 - 2022	FRSS and BER

Table 7.2: An Overview of Required Variables, Data Collection Methods and Data Sources

Sub-sectors	Parameters and Variables	Type of Data	Data Collection Method	Data Source Agency
Agriculture Sector				
Irrigation Sector	Irrigation Area (ha)	Primary	KII	BADC
	Water Demand (m3/ha)		KII	
	Ground Water Use (ha)		KII	
	Surface Water Use (ha)		KII	
Industrial Sector				
RMG Industries Leather Industries Coal Mining Coal-fired Power Generation Beverage Industries	Water Consumption (m^3/ton), Total Production Volume of Products (ton/year), Groundwater Usage (m^3/year), Surface Water Usage (m^3/year), Unit Price of Products (Tk)	Primary	Industrial Survey	Industries determined stratified sampling
Public Sector				
Sewerage	Wastewater Treated (liter/year),	Primary	KII	DWASA
Water Supply and Distribution	Water Supply (m^3/year), Ground Water Abstraction (m^3/year), Surface Water Abstraction (m^3/year), non-revenue water (%)	Primary	KII	DWASA, CWASA, KWASA, RWASA, DPHE
			KII	
			KII	
Water Resources Stock	Surface Water(km^3)	Primary	KII	IWM, BMD, BWDB
	Ground Water(km^3)		KII	
	Inflow from other territories(km^3)		KII	
	Annual Rainfall (km^3)		KII	

Sub-sectors	Parameters and Variables	Type of Data	Data Collection Method	Data Source Agency
Service Sector				
Education Institutes	Water Bills (Tk/year), Water Consumption (liter/year), Ground Water Use (m^3), Surface Water Use (m^3)	Primary	Industrial Survey	Service units determined by the stratified sampling
Health Centers				
Telecommunication				
Hotel and Restaurants				
Financial Intermediaries				
Wholesale and Retail, Repair of Motor Vehicles				

Chapter VIII

Conclusion and Recommendations

Chapter VIII
Conclusion and Recommendations

- The most important finding of this benchmark study is that much of the data related to water accounts is not currently available. However, those missing flow accounts are essential and paramount to the development of comprehensive water accounts for Bangladesh.
- Without such a complete illustration, the water accounting of a particular country and economy may not appear very useful to policymakers for understanding water productivity in different sectors. Besides, many of the estimated figures related to water resources are dated perhaps lacks rigorous validation. Against this backdrop/limitation, new data is required for re-estimation of the water SEEA in Bangladesh.

Another important observation of the study is that several agencies are working in this area. However, most of them lack a clear understanding of the data collection need and hence strategies. It is thus important to pursue the following:

- Developed a work plan and strategy by agencies to collect data. BBS and agencies may agree to develop a road map of data collection for water accounts in Bangladesh.
- Carry out a needs assessment on current capacity and requirements by agencies with regards to data collection template, and data collection strategies.

Following roadmap (i.e. 24-month program) may be adopted to strengthen data collection and hence compilation of the Water Accounts in Bangladesh.

Phases (Timeframe)	**Main Tasks**	**Responsibility**
Preparatory Phase (6 months)	Needs assessment Team formation Work Plan conformation	BBS/CEGIS Administrative Agencies Private Sectors
Data Collection Phase (8 months)		
First 4 months	Data template preparation First round data collection Compilation and discussion	BBS/CEGIS Administrative Agencies Private Sectors
Next 4 months	Data finalization Reporting Dissemination	BBS/CEGIS Administrative Agencies Private Sectors
Water Account Update Phase (4 months)	Compilation of Asset Account Compilation of Physical Supply and Use Table Compilation of Monetary Account	BBS/CEGIS
Reporting, Publication and Dissemination Phase (6 months)	Report Preparation Validation Publication	BBS/CEGIS

Annex

Annex-01: Detailed Tables

Dhaka WATER Supply & Sewerage Authority (DWASA)

Year	Total supply of water (core liter)	Water Bills, Revenue (Tk) (Amount in lakh tk.)	Yearly Revenue (Water+ Sewer) (Amount in lakh tk.)	Yearly Revenue (collection) (Amount in lakh tk.)	Own use Distribution (m^3)
2021	74787.27	126373.28	167675.09	171447.87	-
2022	77256.74	139808.57	185783.00	193233.79	-
2023	79139.43	151329.17	201140.16	208136.63	-

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Year	Distribution (Crore liter)		Unit Price of Water (Residential and industrial rate)		Waste Water Treatment Volume (Crore liter)
	Surface Water (SW)	Ground Water (GW)	Residential rate	Industrial rate	
2021	29829.21	44958.05	14.82	41	20196.01
2022	30679.25	46577.48	15.18	42	22526.33
2023	30984.43	48155.00	15.18	42	24505.61

Yearly Expenditure Operation and Capital (Tk)			
Name	2023-24	2022-23	2021-22
Salary and Wages	2586865679	2455866781	2465168815
Production Overhead	6913464119	5388295964	4801761068
Operation & Maintenance Expenses	3595452435	2445666530	1330827454
Administrative	635406396	612956769	463001850
TOTAL	13731188629	10902786044	9060759187
Property, plant& Equipment (Addition)	1486058056	1239906036	1373012095

Bangladesh Water Development Board (BWDB) Foot note[16]

Year	Rainfall Volume	Water Balance	Irrigation area (ha)	Used water volume (m^3)	Investment (Tk)	Water Bills, Revenue (Tk)
2021	-	-	1655000	5230000000	2132643000	-
2022	-	-	1650000	13920000000	889628000	-
2023	-	-	1649000	15490000000	5055976000	-

[16] *This figure does not include all irrigation areas across the country. Because BWDB is only mandated for the irrigation of medium (1000-5000 ha) and large (>5000 ha) scale water resources where LGED manages water resources less than 1000 ha.

Department of Public Health Engineering (DPHE)

Year	Used Water Volume (m^3)	Revenue of GW, SW used (Tk)	Total Expenditure (Tk)	Investment (Tk)	Yearly Expenditure operation and capital (Tk)	Surface water (SW) and Ground water (GW) distribution
2021	1397088330 *	-	-	-	-	-
2022	1463693000 *	-	-	-	-	-
2023		-	-	-	-	-

***Used Water Volume (m3) is determined by consolidating the supplied domestic water use data of Dhaka Wasa, Rajshahi Wasa, Chittagong Wasa, Khulna Wasa, City Corporations and Pourosovas. Which is the water supply data of urban areas. No other data is currently available.*

Bangladesh Tanners Association (BTA)

Year	Total Water Expenditure (Tk)	Used GW & SW Water Volume(m^3)	Total no. of Industry	Treated Waste Water Volume (m^3)
2021	1,283,904	-	101	-
2022	2,467,808	-	101	-
2023	2,648,501	-	101	2,934,386

Bangladesh Meteorological Department (BMD)

Year	Rainfall (Volume)	Yearly total Precipitation (mm^3)	Evaporation	Evapotranspiration	Irrigation area (ha)
2021	-	93462	-	-	-
2022	-	83157	-	-	-
2023	-	94377	-	-	-

Ministry of Power, Energy and Mineral Resources

Year	Total Used Water in Coal & Mining	Water Expenditure	Used Water Volume	Total Number of Industries	Total Used water in Power Generation
2021	2,30,400.00	-	2,30,400	-	-
2022	1,24,800.00	-	1,24,800	-	-
2023	1,87,200.00	-	1,87,200	-	-

Bangladesh Agro-Processors' Association (BAPA)

Year	Used GW & SW Water Volume (m^3)	Used GW & SW Water Volume (m^3)	Total no. of Industry	Total Consumption of Water (m^3)	Generated Waste Water (m^3)
2021	320859510	80215	317	16043.0	64171.90
2022	247525530	61881	319	12376.3	9505.11
2023	1211021843	302755	337	60551.1	242204

Bangladesh Gas Fields Company Ltd. (BGFCL)

Year	Total Water Used in Power Generation (m^3)	Water Expenditure (Tk)	Used GW Volume (m^3)	Used SW Volume (m^3)	Total Number of Industries
2021	1000	400000/-	1000	-	10 Field
2022	1150	460000/-	1150	-	10 Field
2023	1280	512000/-	1280	-	10 Field

Bangladesh Petroleum Exploration and Production Company Limited (BAPEX)

Year	Total Water Used in Power Generation (m^3)	Water Expenditure (Tk)	Used GW Volume (m^3)	Used SW Volume (m^3)	Total Number of Industries
2021	3.3	5150	-	2.785	07 Production
2022	3.343	5000	-	2.843	07 Production
2023	3.572	6750	-	2.897	07 Production

Barapukuria Coal Mining Company Limited (BCMCL)

Year	Water withdrawal		Total water withdrawal from coal mine (m^3)	Used Water		Total used water in coal mine (m^3)	Cost of Water Withdraw (Tk) (Electricity bill excluding other cost)	Total number of industries
	From Underground(m^3)	From water pump (m^3)		Underground Use (m3)	Surface use (m^3)			
1	2	3	4(2+3)	5	6	7(5+6)	8	9
2021	19806360	954840	20761200	1685000	941700	2626700	350,864,280/- (20761200*16.9)	01 (One): Barapukuria Coal Mining Company Limited
2022	20095440	1173840	21269280	1431000	1160700	2591700	359,450832/- (21269280*16.9)	
2023	19499760	1392840	20892600	1717000	1379700	3096700	408,659,256 /- (20892600*19.56)	

Maddhapara Granite Mining Company Limited

Year	Total Used Water in Coal & Mining	Water Expenditure (Tk)	Used GW Volume (m^3)	Used SW Volume (m^3)	Total Number of Industries
2021	2,30,400.00	-	2,30,400.00	-	-
2022	1,24,800.00	-	1,24,800.00	-	-
2023	1,87,200.00	-	1,87,200.00	-	-

Bangladesh Oil, Gas & Mineral Corporation (Petro Bangla)

Year	Total Water Used in Power Generation (m^3)	Water Expenditure (Tk)	Used GW Volume (m^3)	Used SW Volume (m^3)	Total Number of Industries
2021	-	-	2,30,400.00	-	-
2022	-	-	1,24,800.00	-	-
2023	-	-	1,87,200.00	-	-

Board (BPDB)

Type of Power Plant	Production Capacity (MW)	Water Use as Inputs in the Power Generation(m^3/MW)	Main Source of Water Withdrawal (Insert 1 for ground water and 2 for surface water)	Wastewater Treated (m^3)	Treated Wastewater reused (m^3)
Gas	4187	30	1&2	47968	5080
HFO	742	1.1	1&2	4956	3339
HSD	56	0.2	1&2	-	-
Hydro	230	-	-	-	-
Coal	524	0.203	1	232465	232465
Solar	7	-	-	-	-
Total	5746	-	-	-	-

Annex-02: Water Use in Agriculture

Crops	Water Demand (cum/ha)	Area (ha)	Total (m^3)	Total (km^3)
Boro	8000	4746154	37969230769	37.97
Aman	4000	1394332	5577327935	5.58
Vegetable	4000	565992	2263967611	2.26
Other Crops	3000	866397	2599190283	2.60
Wheat	3000	319433	958299595.1	0.96
Sugarcane	3000	48583	145748987.9	0.15
Cotton	3000	5263	15789473.68	0.02
Potato	3000	426721	1280161943	1.28
Forestry	-	-	2900000000	2.9*
Fisheries	-	-	5200000000	5.2*
Total	-	8372874	58909716599	58.91

*Source: *NCS 2021, IUCN and Yearbook of Agricultural Statistics 2023, BBS*

Water Asset Account of Bangladesh for FY 2021-2022

Sources of Water Resources	Total Renewable Water Resources		Total Volume (Km^3)	Data Source
	Surface Water	Groundwater		
(A) Opening Stock	**1205.91**	**21.122**	1227.032	AQUASTAT*
Addition to Stocks				
(B) Returns (from Economy)			68.74	Estimation**
(C) Precipitation			393.42	AQUASTAT*
(D) Inflows from other territories			1122.00	AQUASTAT*
(E) Discoveries of water in aquifers			-	
(F) Other sources addition to stock			-	
(G) Total additions to stock			2811.19	
Reductions in Stock				
(H) Abstractions (to Economy)			68.74	Estimation**
(I) Evaporation and evapotranspiration			-	
(J) Outflows to the other territories			0.057	AQUASTAT*
(K) Outflows to the sea (Bay of Bengal)			1373	AQUASTAT*
(L) Reduction from Other usage			-	
(M) Total reductions in stock			1441.79	
Closing Stock			1369.40	

*Source: *AQUASTAT 2021, FAO and **CEGIS Estimation,2024*

Annex 03: All Committee

01. Project Steering Committee (PSC)

SL. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
1.	**Ms. Aleya Akter**, **Secretary**, Statistics and Informatics Division, Ministry of Planning	**Chairperson**
2.	**Mr. Mohammed Mizanur Rahman,** Director General (Additional Secretary), Bangladesh Bureau of Statistics (BBS)	Member
3.	**Dr. Nurun Nahar,** Additional Secretary, Programming Division, Planning Commission	Member
4.	**Mr. Md. Younus Mian,** Additional Secretary, NEC-ECNEC and Coordination, Planning Division	Member
5.	**Ms. Rahima Begum,** Joint Secretary, Finance Division, Ministry of Finance	Member
6.	**Dr. Dipankar Roy,** Joint Secretary, Development and Planning Wing, Statistics and Informatics Division, Ministry of Planning	Member
7.	**Dr. Md. Rafiqul Islam,** Joint Secretary, Energy & Mineral Resources Division, Ministry of Power, Energy and Mineral Resources	Member
8.	**Ms. Mazeda Yasmin,** Joint Secretary, NEC & Coordination, Planning Division	Member
9.	**Ms. Zakia Afroz**, Joint Secretary, Ministry of Environment, Forest and Climate Change (MoEFCC)	Member
10.	**Ms. Lutfun Nahar,** Joint Secretary, Ministry of Disaster Management and Relief (MoDMR)	Member
11.	**Ms. Shusoma Sultana,** Deputy Secretary, Planning-8 Branch, Ministry of Agriculture	Member
12.	**Ms. Tahsina Begum,** Deputy Chief, Socio Economic Infrastructure Division, Planning Commission	Member
13.	**Mr. Kamal Hossain Talukder,** Director, Implementation Monitoring and Evaluation Division (IMED), Ministry of Planning	Member
14.	**Dr. Munira Begum,** Joint Chief**,** General Economic Division (GED), Planning Commission	Member
15.	**Mr. Shah Eyamin-Ul Islam,** Deputy Secretary, Development-1, Ministry of Water Resource (MoWR)	Member
16.	**Mr. SK Shamsur Rahman,** Deputy Secretary, Planning Section, Statistics and Informatics Division (SID)	Member
17.	**Mr. Md. Rafiqul Islam,** Director (IC), National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
18.	**Mr. Mohammad Saddam Hossain Khan,** Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
19.	**Mr. Md. Mostafizur Rahman,** Deputy Secretary, Development-1 Section, Statistics and Informatics Division (SID)	**Member-Secretary**

02. Project Implementation Committee (PIC)

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
1.	**Mr. Mohammed Mizanur Rahman,** Director General (DG), Bangladesh Bureau of Statistics (BBS)	**Chairman**
2.	**Dr. Nurun Nahar,** Additional Secretary, Programming Division, Planning Commission	Member
3.	**Mr. Mohammad Obaidul Islam,** Deputy Director General (Joint Secretary), Bangladesh Bureau of Statistics (BBS)	Member
4.	**Dr. Dipankar Roy,** Joint Secretary (Development), Statistics and Informatics Division	Member
5.	**Ms. Zakia Afroz,** Joint Secretary, Ministry of Environment, Forest and Climate Change (MoEFCC)	Member
6.	**Ms. Lutfun Nahar,** Joint Secretary, Ministry of Disaster Management and Relief (MoDMR)	Member
7.	**Dr. Munira Begum,** Joint Chief (Joint Secretary)**,** General Economic Division (GED), Planning Commission	Member
8.	**Ms. Mazeda Yasmin,** Joint Secretary, NEC & Coordination, Planning Division	Member
9.	**Mr. Md. Mostafizur Rahman,** Deputy Secretary (Development), Statistics and Informatics Division	Member
10.	**Ms. Tahsina Begum,** Deputy Chief, Socio Economic Infrastructure Division, Planning Commission	Member
11.	**Mr. Md. Mosharaf Hossain,** Director**,** Implementation Monitoring and Evaluation Division (IMED)	Member
12.	**Mr. Muhammad Ali Prince,** Deputy Secretary, Finance Division, Ministry of Finance.	Member
13.	**Mr. Md. Emdadul Haque,** Director, Demography and Health Wing, Bangladesh Bureau of Statistics (BBS)	Member
14.	**Mr. Md. Rafiqul Islam,** Director (IC), National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
15.	**Mr. Mohammad Saddam Hossain Khan,** Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	**Member-Secretary**

3. Project Technical Committee (PTC)

SL. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
1)	**Mr. Mohammed Mizanur Rahman,** Director General (Additional Secretary), Bangladesh Bureau of Statistics (BBS)	**Chairperson**
2)	**Mr. Mohammad Obaidul Islam,** Deputy Director General (Joint Secretary), Bangladesh Bureau of Statistics (BBS)	Member
3)	**Dr. Dipankar Roy,** Joint Secretary (Development), Statistics and Informatics Division	Member

SL. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
4)	**Dr. A. Atiq Rahman,** Executive Director, Bangladesh Centre for Advanced Studies (BCAS), Dhaka.	Member
5)	**Professor Dr. A. K. Enamul Haque,** Department of Economics, East West University, Dhaka	Member
6)	**Professor Dr. Syed Shahadat Hussain,** Institute of Statistical Research and Training (ISRT), University of Dhaka, Dhaka	Member
7)	**Professor Dr. Bazlul Haque Khondker,** Chairman of the South Asian Network on Economic Modeling (SANEM) and Former Professor, Department of Economics, University of Dhaka	Member
8)	**Professor Dr. M Manzurul Hassan,** Department of Geography and Environment, Jahangirnagar University.	Member
9)	**Professor Dr. Muhammad Shahadat Siddiquee,** Department of Economics**,** University of Dhaka	Member
10)	**Professor Dr. Md. Faruk Hossain,** Department of Geography and Environment, Associate Professor, University of Dhaka.	Member
11)	**Mr. Md. Mostafizur Rahman,** Principal Specialist and Director, Centre for Environmental and Geographic Information System (CEGIS)	Member
12)	**Dr. Md. Abdus Salam,** Chief Scientific Officer, Space Research and Remote Sensing Organization (SPARRSO), Ministry of Defense	Member
13)	**Dr. Shamal Chandra Das,** Addl. Chief Engineer (Civil), Bangladesh Water Development Board (BWDB)	Member
14)	**Mr. Mohammed Solaiman Haider,** Director (Planning), Department of Environment (DOE), MoEFCC, Agargaon, Dhaka	Member
15)	**Ms. Dilruba Karim,** Principal Scientific Officer, Soil Resource Development Institute (SRDI), Farmgate, Dhaka.	Member
16)	**Mr. Md. Mostafizur Rahman,** Deputy Secretary (Development), Statistics and Informatics Division	Member
17)	**Dr. Farida Parveen**, Department of Agriculture Extension (DAE), Ministry of Agriculture, Khamarbari, Dhaka	Member
18)	**Mr. Md. Bazlur Rashid,** Meteorologist, Bangladesh Meteorological Department (BMD), Ministry of Defense, Agargaon, Dhaka.	Member
19)	**Dr. Dilara Zahid,** Director, Institute of Disaster Management and Vulnerabilities Studies, University of Dhaka.	Member
20)	**Mr. Netai Chandra Dey Sarker,** Director (MIM), Department of Disaster Management, Mohakhali, Dhaka	Member
21)	**Mr. Md. Mukhlesur Rahman,** District Fisheries Officer (R), Department of Fisheries, Ramna, Dhaka	Member
22)	**Dr. Hossan Md. Salim,** Livestock Statistical Officer, Department of Livestock Services, Khamarbari, Dhaka.	Member
23)	**Mr. Md. Zaheer Iqbal,** Deputy Conservator of Forest, Bangladesh Forest Department (BFD), MoEFCC, Dhaka.	Member

SL. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
24)	**Mr. Alauddin Al Azad,** Director, Agriculture Wing, Bangladesh Bureau of Statistics (BBS)	Member
25)	**Mr. Md. Emdadul Haque,** Director, Demography and Health Wing, Bangladesh Bureau of Statistics (BBS)	Member
26)	**Mr. Mohammad Abdul Kadir Miah,** Director, Census Wing, Bangladesh Bureau of Statistics (BBS)	Member
27)	**Mr. Md. Rafiqul Islam,** Director (IC), National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
28)	**Mr. S. M. Kamrul Hassan,** Assistant Professor, Department of Disaster Science and Climate resilience, University of Dhaka.	Member
29)	**Mr. Md. Jahangir Alam,** Deputy Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
30)	**Mr. Surangit Kumar Ghosh,** Assistant Project Director (APD), ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
31)	**Mr. Aminur Rahman Khan,** Statistical Officer, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
32)	**Mr. Mohammad Saddam Hossain Khan,** Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	**Member-Secretary**

4. Project Sample Design Committee (PSDC)

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
1.	**Mr. Mohammed Mizanur Rahman,** Director General (Additional Secretary), Bangladesh Bureau of Statistics (BBS)	**Chairman**
2.	**Mr. Mohammad Obaidul Islam,** Deputy Director General (Joint Secretary), Bangladesh Bureau of Statistics (BBS)	Member
3.	**Professor Dr. Syed Shahadat Hussain,** Institute of Statistical Research and Training (ISRT), University of Dhaka, Dhaka	Member
4.	**Dr. Dipankar Roy,** Joint Secretary (Development), Statistics and Informatics Division	Member
5.	**Mr. Kabir Uddin Ahmad,** Director, Computer Wing, Bangladesh Bureau of Statistics (BBS)	Member
6.	**Mr. Md. Rafiqul Islam,** Director (IC), National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
7.	**Mr. Muhammad Mizanoor Rahman Howlader,** Deputy Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
8.	**Mr. Md. Jahangir Alam,** Deputy Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
9.	**Mr. Surangit Kumar Ghosh,** Assistant Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
10.	**Mr. Mohammad Saddam Hossain Khan,** Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	**Member-Secretary**

5. Report Review Committee of SID

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
1.	**Mr. S M Shakil Akhter,** Additional Secretary (Informatics), Statistics and Informatics Division, Ministry of Planning	**Chairman**
2.	**Mr. Debdulal Bhattacharjee,** Joint Secretary (Budget and Audit), Statistics and Informatics Division (SID)	Member
3.	**Mr. Md. Mir Hossain,** Joint Secretary (Development), Statistics and Informatics Division (SID)	Member
4.	**Dr. Dipankar Roy,** Joint Secretary (Informatics), Statistics and Informatics Division (SID)	Member
5.	**Mrs. Salma Pervin** Joint Secretary (Admin-2), Statistics and Informatics Division (SID)	
6.	**Mr. Md. Nurul Karim Vuiyan,** Deputy Secretary, Development-2 Branch, Statistics and Informatics Division (SID)	Member
7.	**Mr. Md. Quamrul Ahsan Talukder, paa,** Deputy Secretary, Admin-4 Branch, Statistics and Informatics Division	Member
8.	**Mr. SK Shamsur Rahman,** Deputy Secretary, Planning Section, Statistics and Informatics Division	Member
9.	**Mr. Md. Mahabur Rahman Sheikh,** Deputy Secretary, Informatics wing-1, Statistics and Informatics Division	Member
10.	**Mr. Kalachand Sarker** Deputy Secretary, Info-3 Section, Statistics and Informatics Division (SID)	Member
11.	**Mr. Mohammad Saddam Hossain Khan,** Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
12.	**Mr. Md. Alimul Azim,** Accounts Officer, Account Section, Statistics and Informatics Division (SID)	Member
13.	**Mrs. Munira Islam**, Deputy Secretary, Info-2 Section, Statistics and Informatics Division (SID)	**Member Secretary**

6. Editor's Forum of BBS

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
1.	**Mr. Mohammad Obaidul Islam,** Deputy Director General (Joint Secretary), Bangladesh Bureau of Statistics (BBS)	**Chairman**
2.	**Mr. Alauddin Al Azad,** Director, Agriculture Wing, Bangladesh Bureau of Statistics (BBS)	Member
3.	**Mr. Md. Emdadul Haque,** Director, Demography and Health Wing, Bangladesh Bureau of Statistics (BBS)	Member

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
4.	**Mr. Kabir Uddin Ahmed,** Director, Computer Wing, Bangladesh Bureau of Statistics (BBS)	Member
5.	**Mr. Mohammad Abdul Kadir Miah**, Director, Census Wing, Bangladesh Bureau of Statistics (BBS)	Member
6.	**Mr. Md. Abdur Rab Dhali, Director,** Bangladesh Bureau of Statistics (BBS)	Member
7.	**Mr. Muhammad Atikul Kabir,** Director, Industry and Labour Wing, Bangladesh Bureau of Statistics (BBS)	Member
8.	**Mr. H. M Firoz,** Director (IC), FA and MIS Wing, Bangladesh Bureau of Statistics (BBS)	Member
9.	**Mr. Md. Rafiqul Islam**, Director (IC), National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
10.	**Mr. Mohammad Saddam Hossain Khan,** Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
11.	**Mr. Ziauddin Ahmed,** Director, SSTI, BBS National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	**Member-Secretary**

7. ECDS Working Team

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
1.	**Mr. Md. Rafiqul Islam,** Director (IC), National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	**Chairman**
2.	**Professor Dr. M Manzurul Hassan,** Department of Geography and Environment, Jahangirnagar University.	Member
3.	**Mr. Mohammad Saddam Hossain Khan,** Project Director, ECDS Project, Bangladesh Bureau of Statistics (BBS)	Member
4.	**Mr. Md. Alamgir Hossen,** Deputy Director, Demography and Health Wing, Bangladesh Bureau of Statistics (BBS)	Member
5.	**Mr. Mohammad Shafiqul Islam**, Deputy Director, National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
6.	**Mr. Muhammad Mizanoor Rahman Howlader**, Deputy Director, National Accounting Wing & ECDS Cell, Bangladesh Bureau of Statistics (BBS)	Member
7.	**Mr. Md. Mizanur Rahman**, Deputy Director, Industry and Labour Wing, Bangladesh Bureau of Statistics (BBS)	Member
8.	**Mr. Aziza Rahman**, Deputy Director, Industry and Labour Wing, Bangladesh Bureau of Statistics (BBS)	Member
9.	**Mr. Tufail Ahmed**, Deputy Director, National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
10.	**Mr. Md. Arif Hossain**, Deputy Director, Census Wing, Bangladesh Bureau of Statistics (BBS)	Member

Sl. No.	Name, Designation and Office (Not according to seniority)	Designation in the Committee
11.	**Mr. Md. Nazmul Hoque,** Deputy Director, National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
12.	**Mr. Muhammad Rafiqul Islam,** Deputy Director, Agriculture Wing, Bangladesh Bureau of Statistics (BBS)	Member
13.	**Mr. Md. Jahangir Alam,** Deputy Director, National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
14.	**Ms. Israt Jahan Nasrin,** Deputy Director, National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
15.	**Mr. Mohammad Eunoush**, Deputy Director, National Accounting Wing, Bangladesh Bureau of Statistics (BBS)	Member
16.	**Mr. Mohammad Anamul Haque,** Maintenance Engineer, Computer Wing, Bangladesh Bureau of Statistics (BBS)	Member
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